FAMOUS RUSSIAN AIRCRAFT

ILYUSHIN IL-28

YEFIM GORDON
AND
DMITRIY KOMISSAROV

As the Second World War ended and the Cold War began, the Soviet Union urgently needed to bring its aircraft industry up to date, especially in the use of jet propulsion. Fighters came first, but the Ilyushin IL-28 became the Soviet Union's first operational jet bomber. First flown in July 1948 and with over 6,300 built, it saw extensive service in a host of versions until the 1980s, its longevity and versatility gaining it the nickname of the 'Soviet Canberra'.

Like its British counterpart, the IL-28 was adapted to a multitude of roles, including with the Soviet air force and navy, Aeroflot and with more than 20 export operators. It saw combat in various conflicts including the Korean War, Vietnam, Cuban Missile Crisis and even on both sides of the Suez Crisis.

The IL-28 was also modified for use as a testbed for many areas of research and development including engines, target-towing, in-flight refuelling, ejection seats and played a significant role in the Soviet nuclear programme.

This extensively-illustrated book from leading Russian experts presents new information of the aircraft's development, service use, operators, variants and individual aircraft. Technical details, gleaned from many Soviet and Russian – and indeed foreign – sources, combine to make this the 'go-to' reference for this historically important and successful aircraft.

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ILYUSHIN IL-28

YEFIM GORDON
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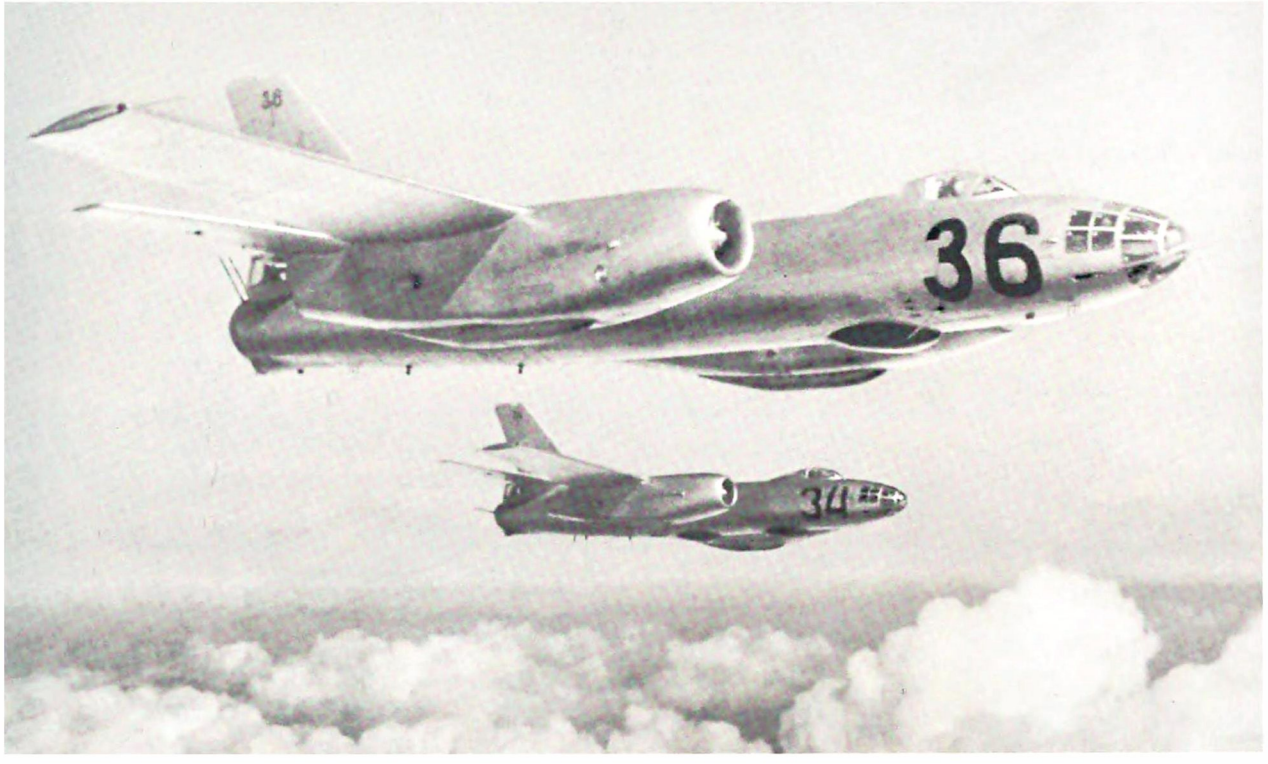
Ilyushin IL-28

tactical bomber

Yefim Gordon and Dmitriy Komissarov



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Title page: A Soviet Air Force IL-28 bomber coded '36' leads an IL-28RTR ELINT aircraft in echelon port formation. Note the different style of the numeral 3 suggesting that the aircraft belong to different units.

Right: A flight of three IL-28s is readied for a sortie in early spring or late autumn, with six sister ships under wraps parked at the far end of the flight line.

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Maintenance in progress on an IL-28R photo reconnaissance aircraft coded '21 Red'. The aircraft is jacked up for a landing gear check; note the canvas covers on the wingtip fuel tanks. The ZiL-164 lorry is probably an APA-1 ground power unit.

Introduction

Like the other Allied nations who had been involved in the Second World War, the Soviet Union was very active designing new types of weapons and military technologies in the early post-war years. Having examined German war booty aircraft (including production jet- and rocket-powered fighters and bombers) and the state of Nazi Germany's aeronautical research, American, British and Soviet aircraft designers reached the same conclusion: indigenous jet aircraft designs were needed. The situation was singularly unpleasant for the Soviet Union, which was lagging behind – the USA and the UK already had practical jet aircraft at the end of the war; now was the time to catch up. This was all the more important because, hardly having emerged from a 'hot' war, the erstwhile allies were rapidly drifting apart and becoming adversaries in the Cold War.

Not surprisingly, fighter design was the first to benefit from the advent of the turbojet engine. Fighters enjoyed top priority, while jet bombers were sort of relegated to second place. Still, the turbojet inevitably found its way to bombers as well; after all, if fighters were becoming faster, then the bombers had to become faster still to outrun the fighter threat.

According to contemporary Soviet military strategy, conventional and nuclear strikes against targets in the enemy's tactical area were to be delivered by tactical (i.e. light) bombers. Development work on jet tactical bombers in the USSR was probably 'kicked off' in 1945 when the OKB-165 engine design bureau (***op**ytno-kon**strook**torskoye byu**ro*** – experimental design bureau) led by Arkhip Mikhaïlovich Lyul'ka brought out the S-18 axial-flow turbojet rated at 1,250 kgp (2,755 lbst) – the first indigenous true jet engine to reach the hardware stage; in its flight-cleared form rated at 1,350 kgp (2,980 lbst) for take-off it was redesignated TR-1 (***toor**bore'ak**tiv**nyy* [***dvig**atel'*] – turbojet engine). Actually Lyul'ka had started work on his first turbojet, the 400-500-kgp (880-1,100-lbst) axial-flow RD-1 (*re'ak**tiv**nyy **dvig**atel'* – jet engine), back in 1939, but the outbreak of the war had caused the project to be shelved.

The only other turbojets available to Soviet aircraft designers immediately after the war were low-powered German engines – the 800-kgp (1,760-lbst) BMW 003A and the 900-kgp (1,980-lbst) Junkers Jumo 004B, which were later reverse-engineered as the RD-10 and RD-20 respectively, pending the availability of something better. The situation improved somewhat when, in an effort to save time, the Soviet Union purchased Rolls-Royce Nene I/Nene II and Rolls-Royce Derwent V centrifugal-flow turbojets in the UK in parallel with ongoing efforts to create indigenous designs.

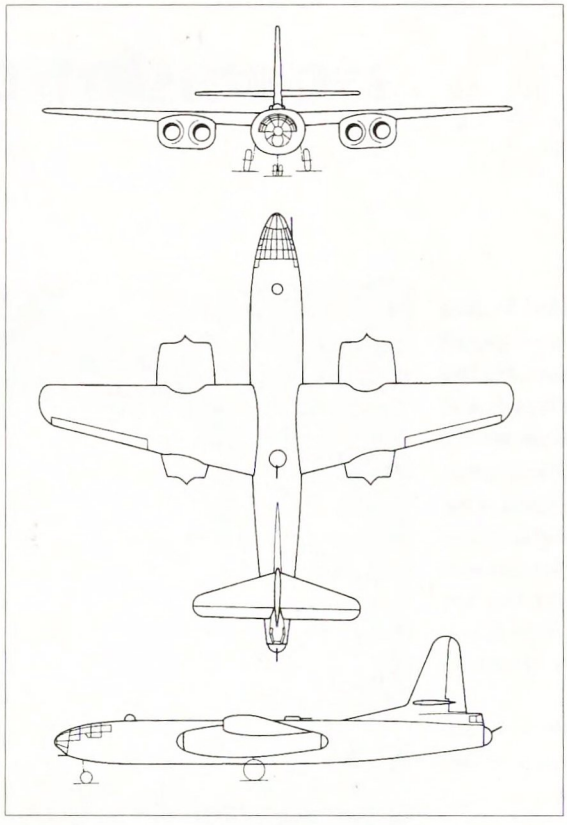
In the late 1940s jet bombers were under development at OKB-156 led by Chief Designer (later General Designer) Andrey Nikolayevich Tupolev, OKB-240 led by Sergey Vladimirovich Ilyushin and OKB-134 led by Pavel Osipovich Sukhoi. Even OKB-1 led by the German 'war booty' designer Brunolf Baade joined the race.

OKB-240 General Designer Sergey V. Ilyushin in the first post-war years.

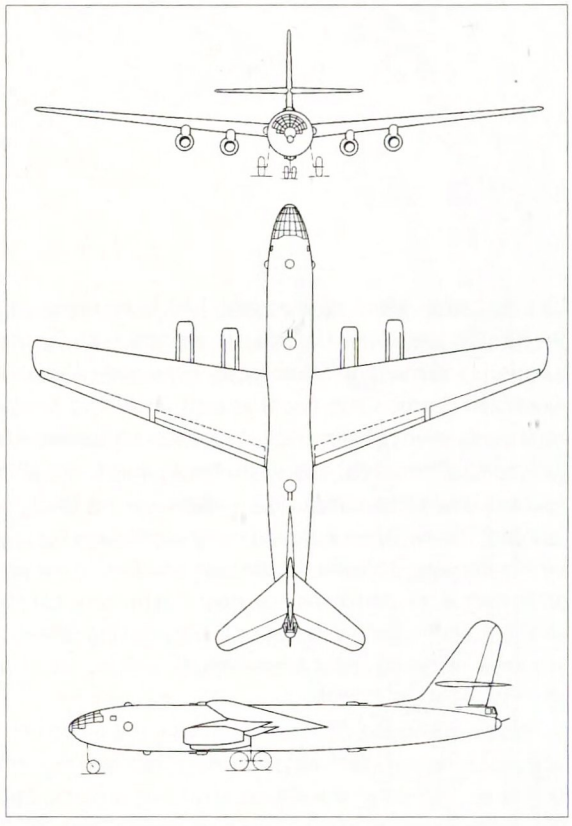
The Ilyushin OKB's contribution merits special attention – for more than one reason. When OKB-240 was tasked with creating a bomber having a 2,000-kg (4,410-lb) normal bomb load, a 3,000-kg (6,610-lb) maximum bomb load and a range of 1,250 km (776 miles) with a normal bomb load, it had knowledge of foreign work on jet-powered heavy aircraft but no prior experience with jets to fall back on. Nevertheless, in spite of being officially an experimental aircraft, the IL-22 – the first aircraft thus designated – was developed as a fully capable bomber, with all due attention to detail.

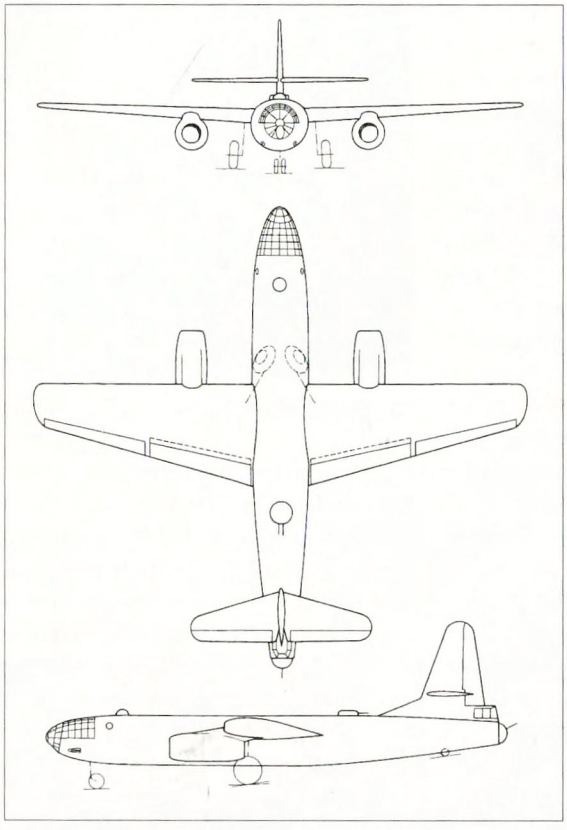
(A note on spelling must be made here. Generally the convention with Soviet/Russian/Ukrainian aircraft and helicopters is that the official service designation is prefixed by the first two letters of the OKB head's (or founder's) last name; that is, 'An' for Antonov, 'Be' for Beriyev, 'Ka' for Kamov, 'Su' for Sukhoi, 'Tu' for Tupolev and so on. Thus, the designations of aircraft from the Ilyushin OKB are prefixed 'Il', with a lower-case 'L'. However, in many fonts the upper-case 'I' and the lower-case 'L' appear

Right: An alternative project layout of the IL-22 featuring paired engine nacelles extending beyond the wing trailing edge.



Far right: A rather different PD project version of the IL-22 with forward-swept dihedral wings and swept tail surfaces. Note also the tandem-wheel main gear bogies replacing the large single mainwheels.



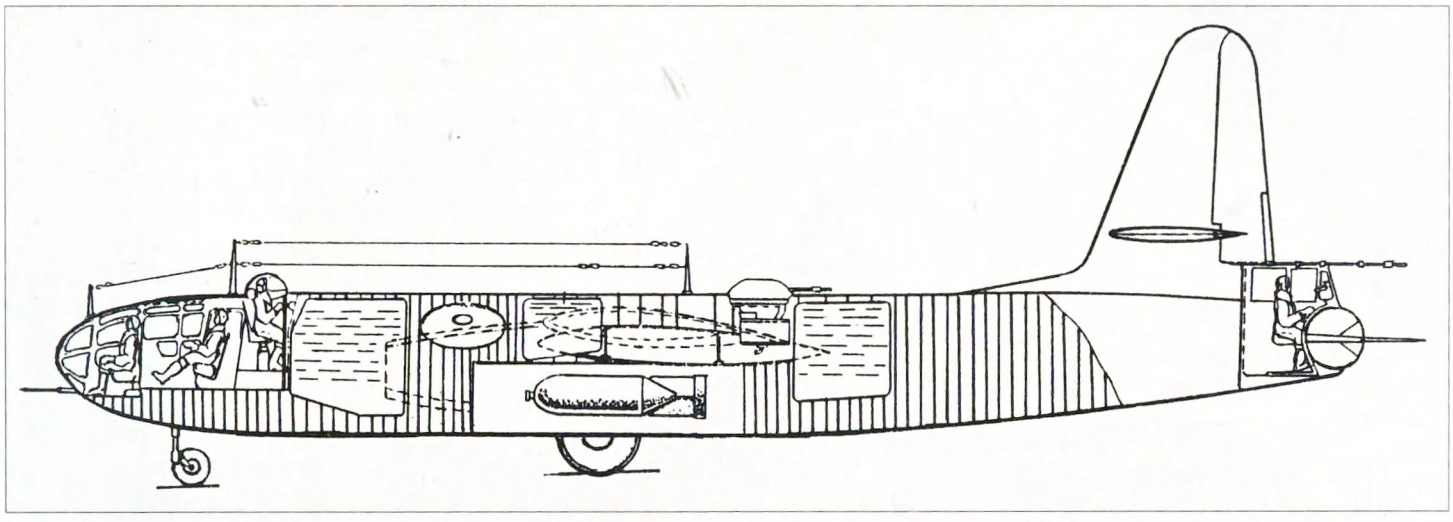


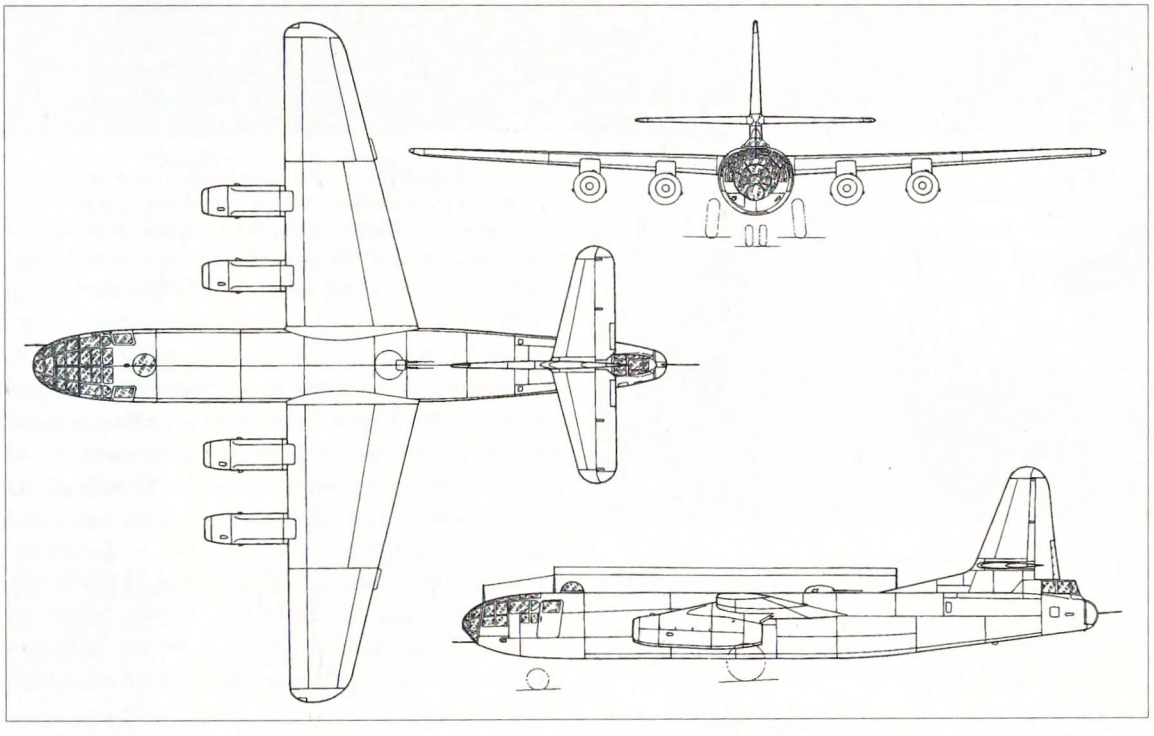
A three-view drawing of the IL-24, showing the two AM-TKRD-01 turbojets and the retracted position of the mainwheels.

identical, or near-identical, as here; this might cause confusion, the prefix looking like a Roman numeral II. Therefore the authors have chosen to stretch a point and render the prefix as 'IL', with an upper-case 'L'.)

Being designed for a maximum speed of 800 km/h (496 mph) or Mach 0.75, the bomber had a conventional layout with mid-set unswept wings (though some might choose to regard them as shoulder-mounted) and an unswept conventional tail unit with the horizontal tail positioned above the rear fuselage. The IL-22 was built around four TR-1 turbojets, thus becoming the first Soviet four-turbojet bomber. The engines were accommodated under the wings in widely spaced individual pods, echoing the layout of the much smaller German Arado Ar 234 V6b bomber prototype. However, unlike the latter's conformal nacelles protruding beyond the wing trailing edge, the IL-22's engine nacelles were carried almost entirely ahead of the wing leading edge on short horizontal pylons; this was a 'first' in world jet aircraft design. The bomber had a tricycle landing gear – a novel feature for Soviet aircraft at the time; all three units retracted into the fuselage, the twin-wheel nose unit retracting aft and the main units with large single wheels retracting forward. To accommodate the stowed mainwheels better and maximise the wheel track at the same time, the fuselage had an elliptical cross-section with the larger axis horizontal along most of its length.

The IL-22 had a crew of five. The captain and co-pilot sat side by side in an extensively glazed pressurised cabin with a parabolic nose reminiscent of the Tupolev B-4 (Tu-4, NATO reporting name *Bull*) heavy bomber – a Soviet reverse-engineered version of the Boeing B-29 Superfortress, which was undergoing tests

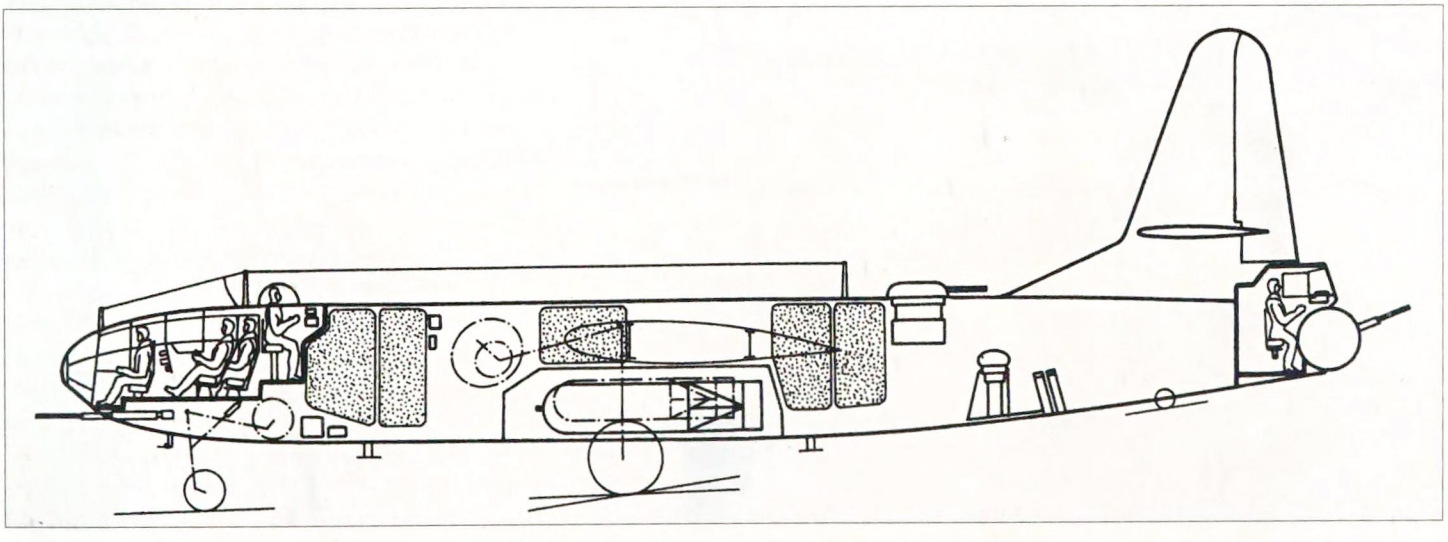


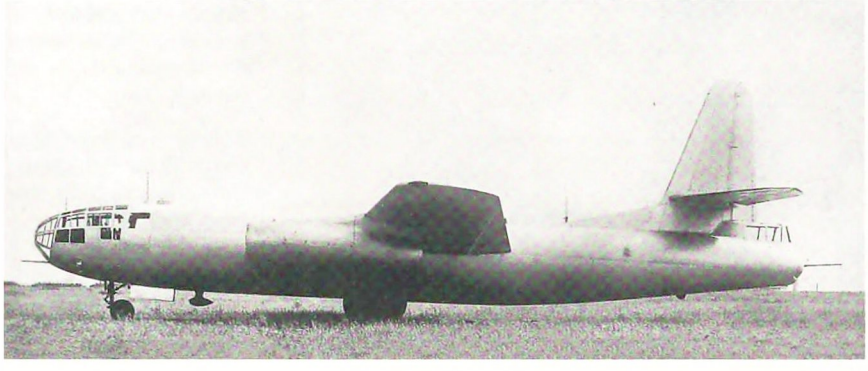


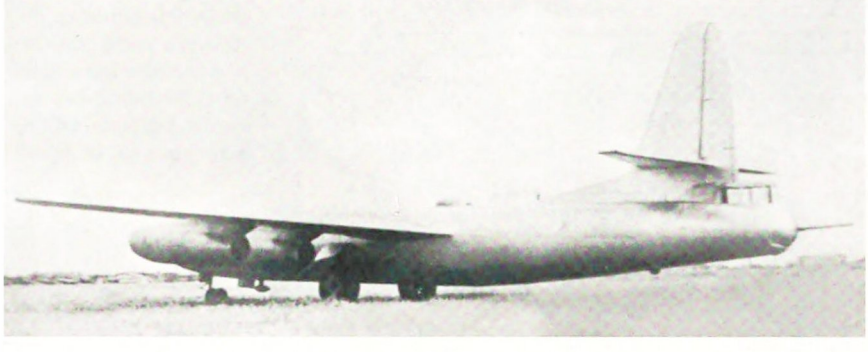
A cutaway drawing of the IL-22 from the project documents showing the three fuel tanks with the mainwheel wells and the dorsal turret in between.

A three-view drawing of the IL-22 accentuating the narrow landing gear track and the 'all-glass' nose.

A cutaway drawing of the IL-24 from the project documents. Note the strike camera and the flare launchers aft of the bomb bay, as well as the small wheel acting as a tail bumper.







Three views of the IL-22 during trials. These photos illustrate the bomber's extremely small ground clearance and the position of the engines relative to the wings. Note the large crew entry door on the port side of the nose. The IL-22 was totally devoid of insignia.

at the time, with the navigator/bomb-aimer ahead of them. The dorsal gunner/radio operator sat immediately behind them under an observation blister, working the dorsal barbette, while the tail gunner had the rear pressure cabin all to himself. The design normal take-off weight was 24,000 kg (52,910 lb).

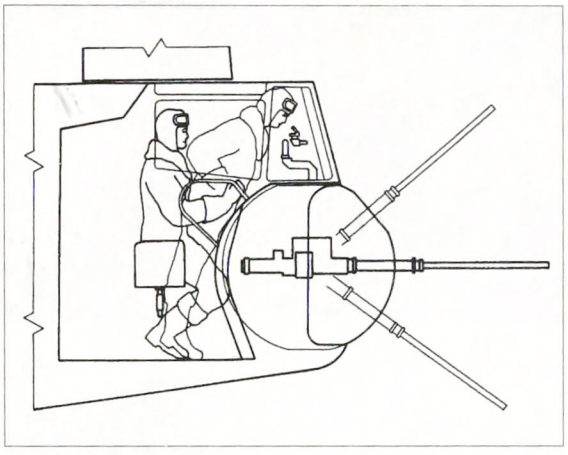
A few words have to be said about the IL-22's armament. All bombs were carried internally; the bomb bay was large enough to accommodate a 3,000-kg FAB-3000M-46 bomb (*foo**gahs**naya **avia**bom**ba* – high-explosive bomb, 1946 model). The defensive armament comprised four cannons – a forward-firing 23-mm (.90 calibre) Nudelman/Suranov NS-23 cannon, a pair of 20-mm (.78 calibre) Berezin B-20E cannons in an electrically-powered remote-controlled dorsal barbette aft of the wings and a further NS-23 cannon in a KU-3 hydraulically-powered tail turret (*kormo**va**ya* [*strel**kov**aya*] *oosta**nov**ka* – tail barbette). The latter was designed in house and hence is sometimes referred to as the IL-KU-3. Among other things, the designers intended to test various types of cannon barbettes on the IL-22.

The designers put their 'fighter maker' colleagues' design experience with the first Soviet jet fighters to good use. The IL-22's wing airfoils developed by the Central Aerodynamics & Hydrodynamics Institute named after Nikolay Ye. Zhukovskiy (TsAGI – *Tsen**trahl**'nyy **a**ero- i **ghid**rodina**mich**eskiy insti**toot***) were the same as on the Mikoyan/Gurevich I-300 (MiG-9 *Fargo*), namely 1-A-10 on the inner wings and 1-V-10 airfoil on the outer wings, but had a higher thickness/chord ratio of 12% in both cases. Also, the MiG-9 – and, for that matter, its swept-wing successor, the I-310 (MiG-15 *Fagot-A*) – was afflicted by a tendency to drop a wing at high Mach numbers. This problem was caused by aerodynamic asymmetry resulting from insufficiently high manufacturing standards – there was a slight disparity between the port and starboard wing airfoils and hence wing lift. This was not critical at low

speeds, but as airspeed increased the difference became appreciable. Being aware of this problem, Ilyushin took care to design it out of the IL-22. The bomber's wings and tail surfaces had a manufacturing break along the chord line – almost like the parts of a plastic model kit; each half was manufactured 'from the skin up', making sure that the airfoils were correct when the airframe components had been assembled. The fuselage sections, too, were manufactured in port and starboard halves, using the same technology. This incurred a slight weight penalty but simplified the manufacturing process greatly, allowing the prototype to be built quickly.

Development and prototype construction proceeded quickly. On 24th July 1947 the IL-22 made its 19-minute maiden flight, captained by Vladimir K. Kokkinaki, with his brother Konstantin K. Kokkinaki as co-pilot; thus it became the second Soviet jet bomber to fly, barely a month after Tupolev's experimental 'aircraft 77' (aka Tu-12, a heavily-modified Second World War-vintage Tu-2 *Bat* tactical bomber refitted with two 2,270-kgp (5,000-lbst) Rolls-Royce Nene IIs and a tricycle landing gear). On 7th February 1948 the IL-22 achieved a 'first' in Soviet bomber design when it performed a take-off with two 1,500-kgp (3,310-lbst) SR-2 jet-assisted take-off (JATO) boosters (SR = ***star****tovaya* ra***ket****a* – rocket booster).

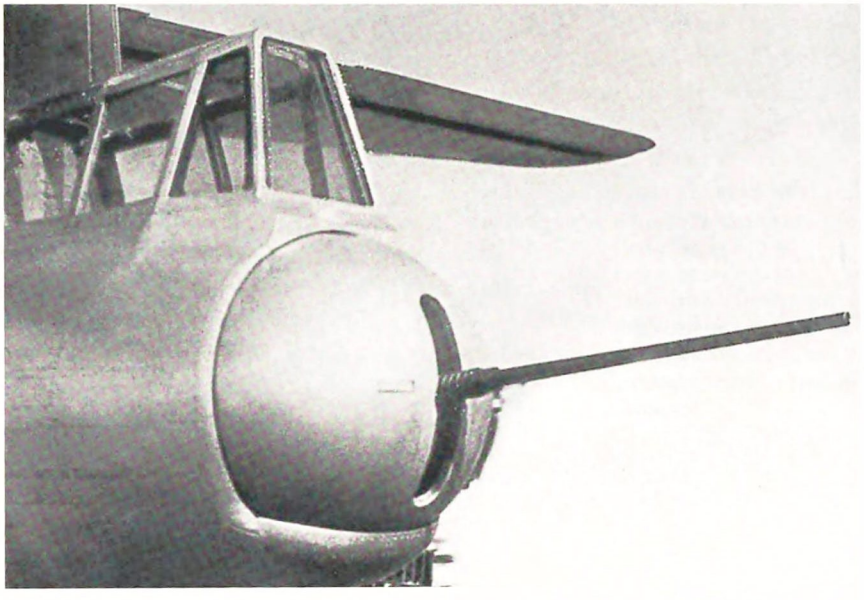
The bomber proved easy to fly in all modes. However, tests quickly showed that its performance fell utterly short of the target because of the troublesome TR-1 engines, which had to be derated to only 900 kgp for the sake of reliability. As a result, the bomber was sorely underpowered; hence the take-off weight had to

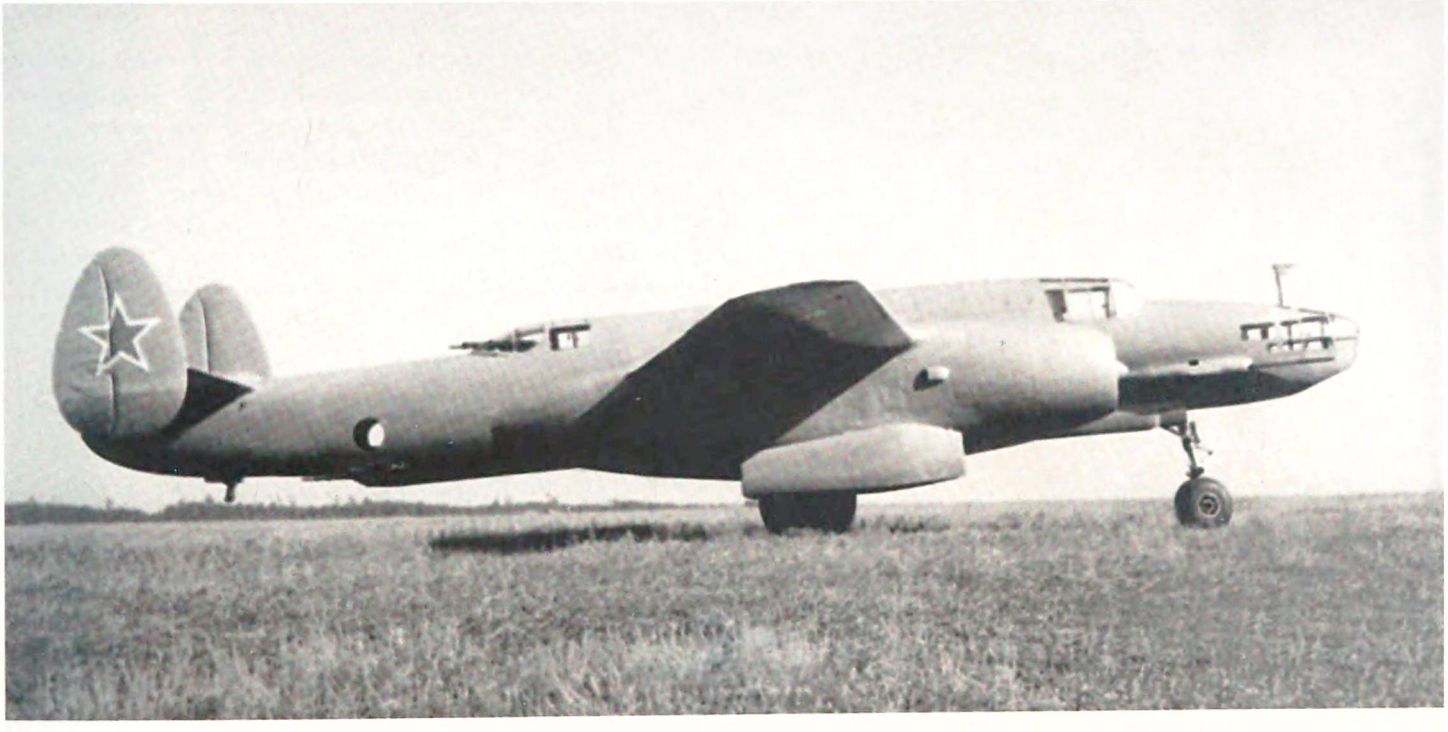


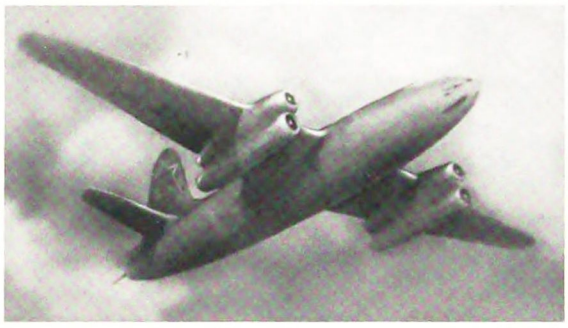
Left: This drawing of the IL-22's tail gunner's station shows the cannon's elevation angles. Note how the gunner stood on tip-toe when the cannon was fully depressed.

Below: The tail gunner's station and KU-3 tail turret of the IL-22.

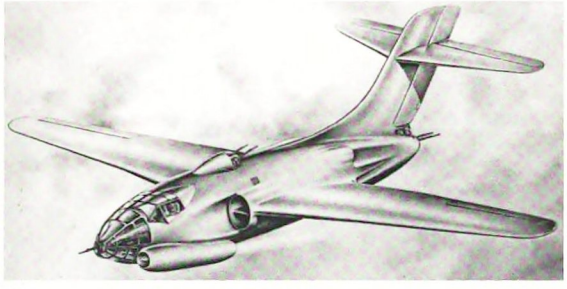
Bottom: The Tu-12 ('aircraft 77') bomber designed concurrently with the IL-22.



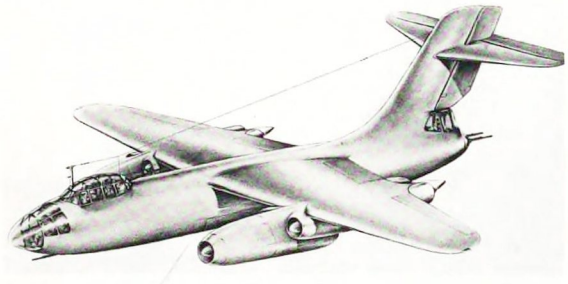




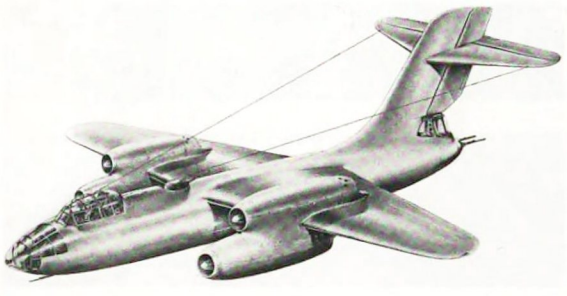
An artist's impression of the Myasishchev RB-17 (VM-24) tactical bomber. It was to be powered by four Jumo 004B (RD-10) turbojets.



An artist's impression showing project version 1 of the Sukhoi Su-10 tactical bomber with six RD-10s (two flanking the nose and four in vertical pairs at the wing roots).



The second project version of the Su-10 with a redesigned cockpit section and wing-mounted triplets of RD-10s; note that the centre engine in each cluster is located further forward.



This artist's impression shows the Su-10 as actually built (but not flown), with four TR-1 turbojets in staggered vertical pairs.

be limited to not more than 20,000 kg (44,090 lb), a range of only 865 km (537 miles) and a top speed of 718 km/h (446 mph) at 7,000 m (22,965 ft) were attained. Moreover, even at this reduced rating, the engines' service life did not exceed 20 hours, which was unacceptably short. Upon completion of the manufacturer's flight tests on 25th February 1948 the Ilyushin OKB chose not to submit the IL-22 for state acceptance (i.e., certification) trials. Upon retirement the sole prototype was relegated to the Bureau of New Hardware (BNT – *Byu**ro novoy tekh**niki*), a subdivision of the Ministry of Aircraft Industry (MAP – *Mini**ster**stvo aviatsi**on**noy pro**myshl**ennosti*), where it could be studied by leading industry experts.

The seemingly obvious solution was to install more powerful engines. Thus, in the spring of 1947, even as the IL-22 was being built, the Ilyushin OKB evolved a derivative designated IL-24 – again the first aircraft to use this designation. It differed from the original model mainly in being powered by two 3,300-kgp (7,275-lbst) Mikulin AM-TKRD-01 axial-flow turbojets and equipped with a new KU-4 twin-cannon tail turret. Yet MAP intervened, reallocating these engines to the 'Type 140' experimental bomber with forward-swept wings (FSW) – a derivative of the captured Junkers EF 131 which was developed by Baade's team of interned German designers at OKB-1. Undeterred, Ilyushin reworked the project to take four RR Nene Is; however, the aircraft turned out to be too heavy – grossing at 28,000 kg (61,730 lb), it would be able to operate only from paved runways, which were still scarce in the Soviet Union in the late 1940s. However, it turned out that the IL-24 was never to be built.

Speaking of which, Sergey V. Ilyushin obviously knew of the work in progress at OKB-1 because OKB-240 brought out its own FSW version of the IL-22! The wings had strong dihedral from the roots and the engines were again mounted in individual nacelles. Moreover, the tail surfaces were swept back, with stronger sweep on the horizontal tail. The main gear units were also redesigned to feature bogies with two smaller wheels in tandem. A less radically redesigned version of the IL-22 had the engines in paired nacelles which extended beyond the wing trailing edge.

(As an aside, much later, in the 1970s, the IL-22 designation was reallocated to a purpose-built airborne command post version of the IL-18D *Coot* four-turboprop medium-haul airliner for the Soviet Air Force; the IL-22 was codenamed *Coot-B*. The IL-24 designation was also reused for the IL-24N civil ice reconnaissance aircraft – another spinoff of the IL-18D.)

Meanwhile, the Tupolev OKB brought out the 'aircraft 73' tactical bomber (aka Tu-73), which first flew in December 1947 and was the progenitor of the Tu-73/Tu-78/Tu-81/Tu-89 series of prototypes. The latter aircraft was eventually to see limited production and service as the Tu-14 *Bosun*. The Sukhoi OKB developed the Su-10 light bomber, but the prototype was scrapped without ever being flown when OKB-134 was dissolved in 1949. There had been yet another contender, OKB-482 led by Vladimir M. Myasishchev with his VM-24 (aka RB-17) four-turbojet bomber project. However, it never materialised because Myasishchev was out of favour with Soviet leader Iosif V. Stalin and consequently his projects received a 'thumbs-down' at the time. In fact, when OKB-482 was closed down in 1946, much of its staff and the VM-24 project materials were transferred to OKB-240, coming in handy when the IL-22 was being designed.

This was basically the situation in which the subject of this book – the Ilyushin IL-28 – was born to become the Soviet Union's first operational jet bomber.

CHAPTER ONE

Breeding the *Beagle*

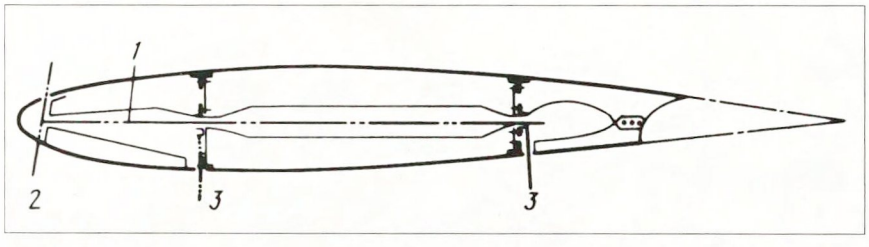
The results of the IL-22's tests were not entirely encouraging. Quite apart from the engine-related issue and the resulting shortfall in performance mentioned in the introductory section, the pilots promptly pointed out that the view from the flight deck was inadequate. The moulded flight deck glazing, which was blended entirely into the nose contour and composed of multiple panes, distorted the view and generated annoying reflections, while the heavy framework created numerous 'blind spots', reducing the field of view. (A similar problem was experienced with the Tu-4, albeit this was probably due in part to the lower quality of the Soviet Plexiglas as compared to the US original.) Another problem concerned the IL-22's defensive armament. Tests had shown that the remote-controlled dorsal barbette was inefficient because the tail unit created large blind sectors. Also, the dorsal gunner's station was located well ahead of the barbette; hence some areas where the cannons could be brought to bear on the target were concealed from the gunner's view by the wings and fuselage.

All things considered, in late 1947 General Designer Sergey V. Ilyushin took the decision to discontinue further work on the IL-22/IL-24 and begin development of a new bomber designated IL-28. On 31st October that year he wrote to Minister of the Armed Forces (*sic* – that was then the official title) Nikolay A. Bulganin, offering to develop a tactical bomber powered by two Rolls-Royce Nene II turbojets, with a first flight date tentatively set for July 1948. Thus, the

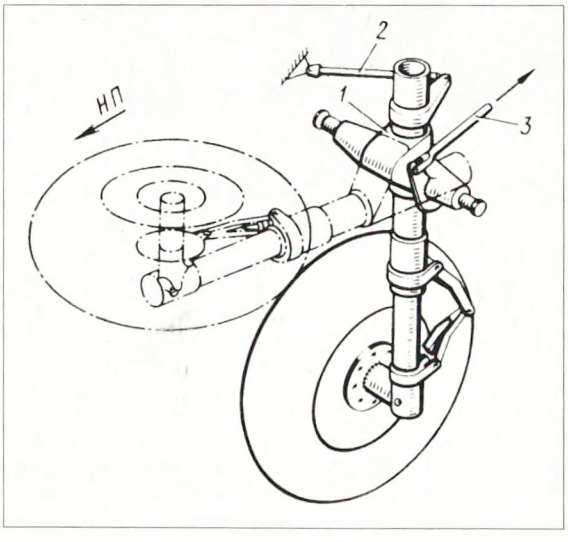
General Designer Sergey V. Ilyushin (seated, centre) and the department heads of OKB-240 in 1949 during the development of the IL-28.

Above: Sergey V. Ilyushin with the draftsmen of OKB-240 during the design work on the IL-28.

IL-28 was to be designed within a mere eight months; this tight development schedule was due in no small part to the experience accumulated with the IL-22, which would allow the new bomber to be developed quickly.



Above: The IL-28's wings featured manufacturing breaks along the chord line (1), at the leading edge (2) and on the upper/lower panels in line with the spars (3) to facilitate manufacturing and assembly.



The port main gear unit showing the fulcrum (1), the link rotating the wheel horizontal during retraction (2) and the link to the actuating ram (3). The arrow is marked 'direction of flight'.

The objective was to achieve a performance far superior to that of the IL-22, with a design maximum speed of 850-900 km/h (527-559 mph), a range of 2,500 km (1,552 miles) and a service ceiling of 11,000-12,000 m (36,090-39,370 ft). This was made possible by reducing the crew and rethinking the defensive armament concept.

In general arrangement the IL-28 was similar to the predecessor – or rather the twin-engined IL-24 project version, featuring shoulder-mounted unswept wings, conventional tail surfaces and wing-mounted engine nacelles. However, the fuselage now had a circular cross-section, the wings were set somewhat higher, the tail surfaces were swept back sharply and the engine nacelles were conformal, adhering directly to the wing underside without any pylons. This was due to the new bomber's higher design maximum speed of Mach 0.85 and different operating conditions (unlike the IL-22, the IL-28 was designed to operate mainly from tactical airfields with unpaved runways). And there was more than met the eye – some of the important differences were not so obvious. This warrants a more detailed description.

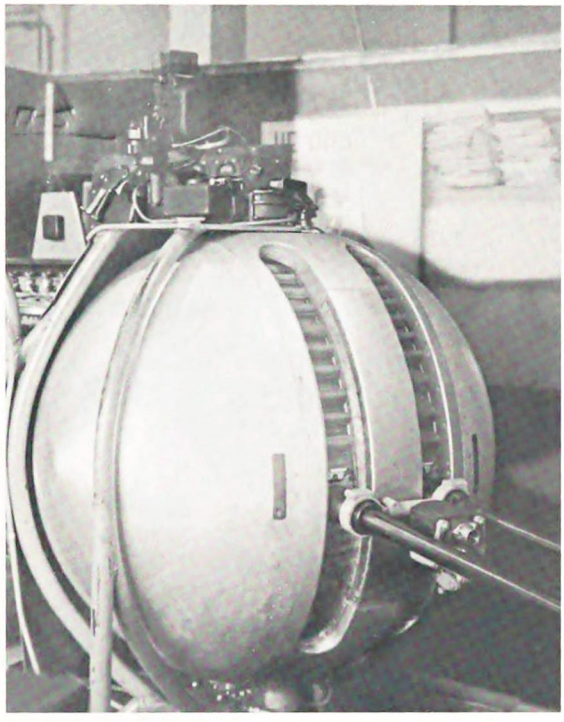
Firstly, Sergey V. Ilyushin deemed it possible to reduce the IL-28's crew to three – the pilot, the navigator/bomb aimer (who also acted as the flight engineer) and the tail gunner, who would take over the functions of the radio operator from the eliminated dorsal gunner. This decision was dictated mainly by the limited mission time of a tactical bomber. At the

anticipated cruising speed of 650-750 km/h (403-465 mph) a sortie would typically last 2-2.5 hours – four hours at the most. An autopilot would be fitted to compensate for the lack of a co-pilot, easing the pilot workload in cruise flight.

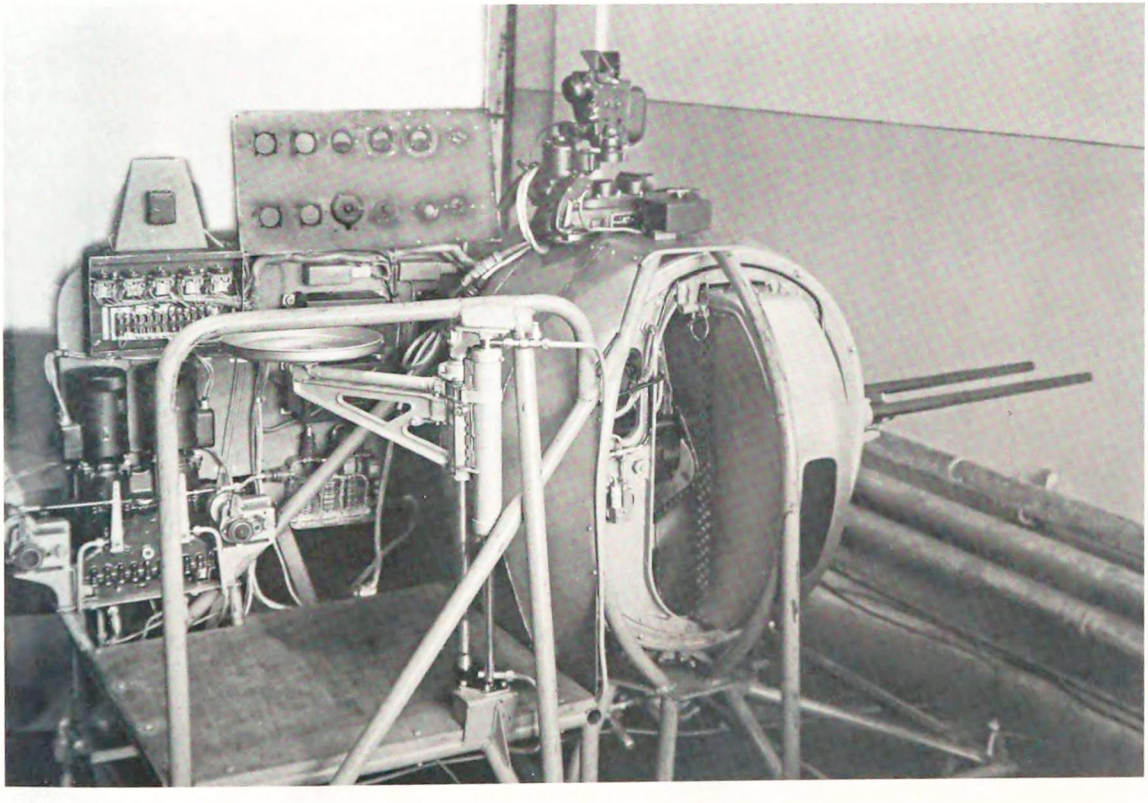
While we are on the subject of the crew, it should be mentioned that the IL-28 likewise had two pressurised compartments – one for the pilot and the navigator/bomb-aimer, the other for the gunner/radio operator (GRO). At low altitudes these were pressurised by ram air; from 1,700 m (5,580 ft) and up the compartments were sealed off and pressurised by filtered air supplied by engine-driven compressors. The pressurisation system was combined with the heating and ventilation systems. The crew compartments had armour protection, the gunner's station featuring bulletproof glazing.

Addressing the cockpit view problem encountered on the IL-22, the designers provided the pilot with a fighter-type cockpit canopy having a fixed windshield and a sideways-opening jettisonable portion. The extensive nose glazing was still there of necessity, but now the navigator/bomb-aimer had the glazed nose all to himself, his workstation being separated from the cockpit by a bulkhead and accessed via a jettisonable dorsal hatch. Despite being seated in a fighter-type cockpit, the pilot had a typical bomber-type control yoke with a W-shaped wheel, not a control stick.

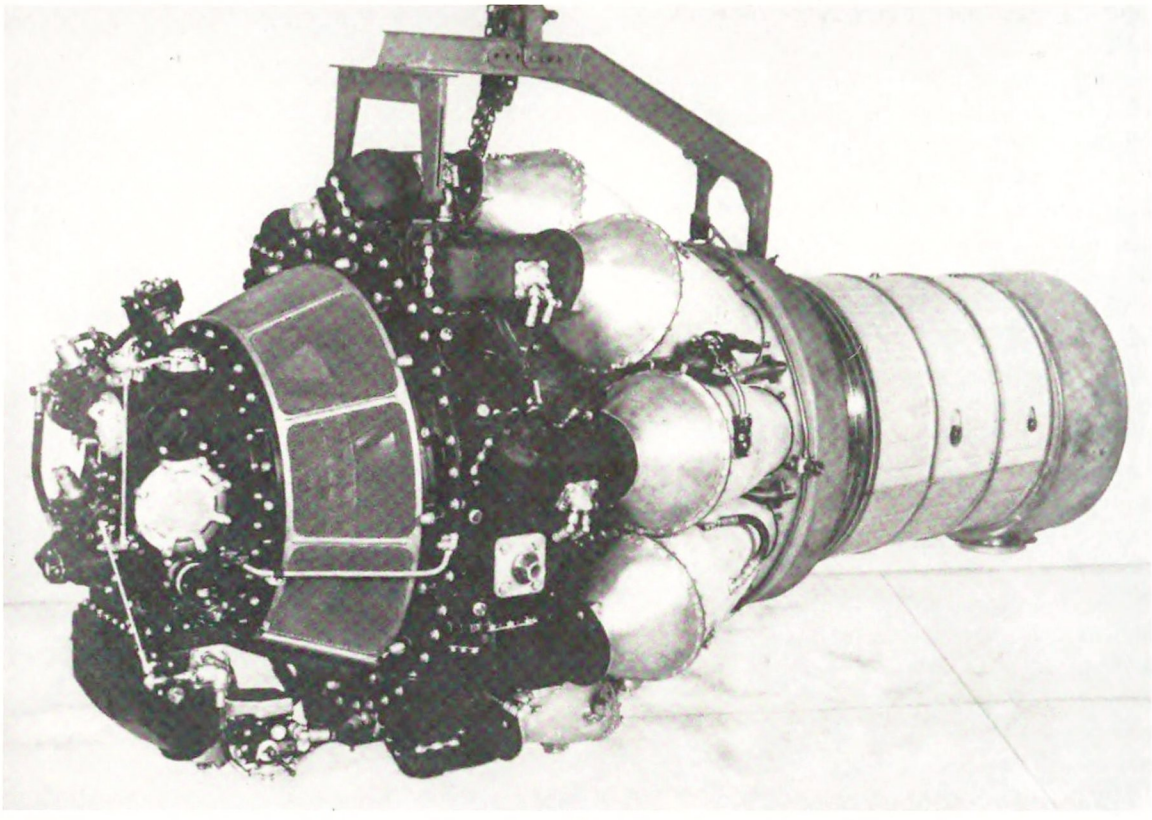
The IL-28's higher speed necessitated a new approach to the crew rescue system. On the IL-22, all crew members were to bail out conventionally, but now this was no longer possible for the pilot and the navigator/bomb-aimer. Hence they were provided with upward-firing ejection seats; as was customary in the USSR in those days, the seats were designed in house. The GRO still bailed out conventionally via the ventral entry hatch; its cover opened by means of pneumatic rams, acting as a slipstream deflector. Rather than use the smooth inside of the hatch cover like a slide at a



A prototype of the KU-6 hydraulically powered 'ball turret' on a test rig.



Another view of the same rig showing the computing gunsight and other associated equipment to be mounted inside the gunner's station; the turret's starboard fairing is detached for access to the ammunition boxes. Note the gunner's seat on a vertical ram which raised and lowered him as the cannons moved down and up respectively to maintain the correct line of sight.

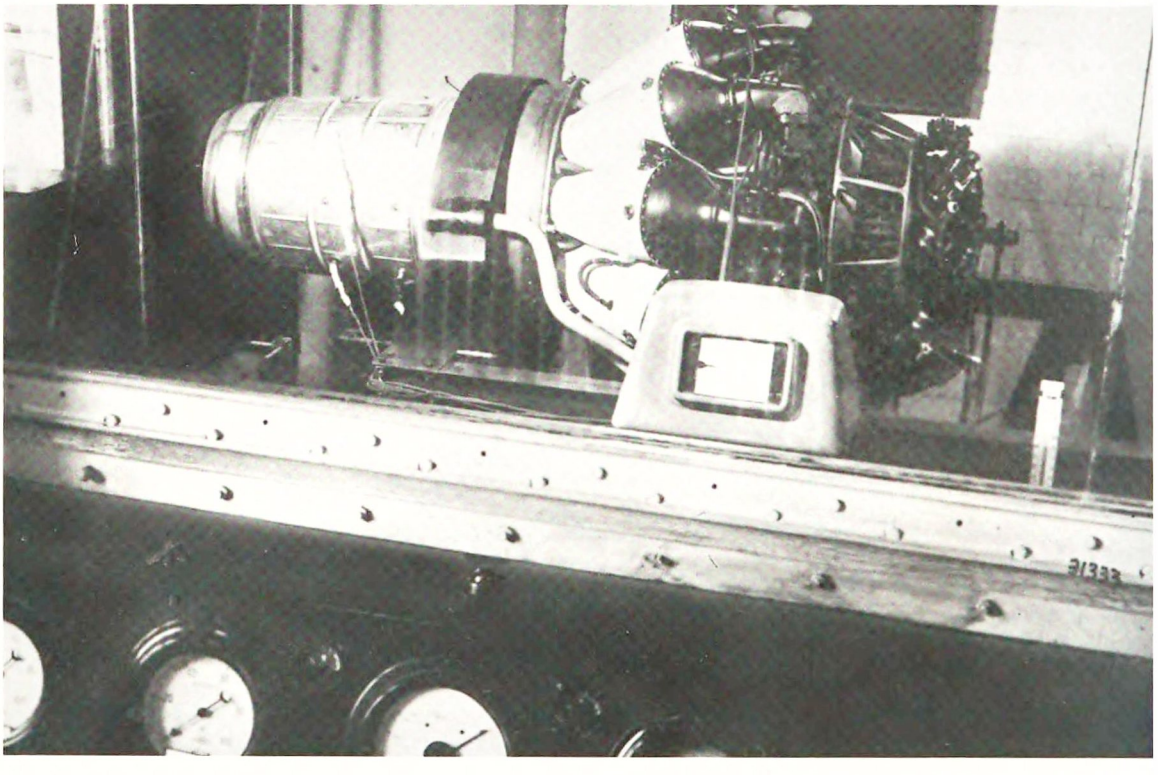


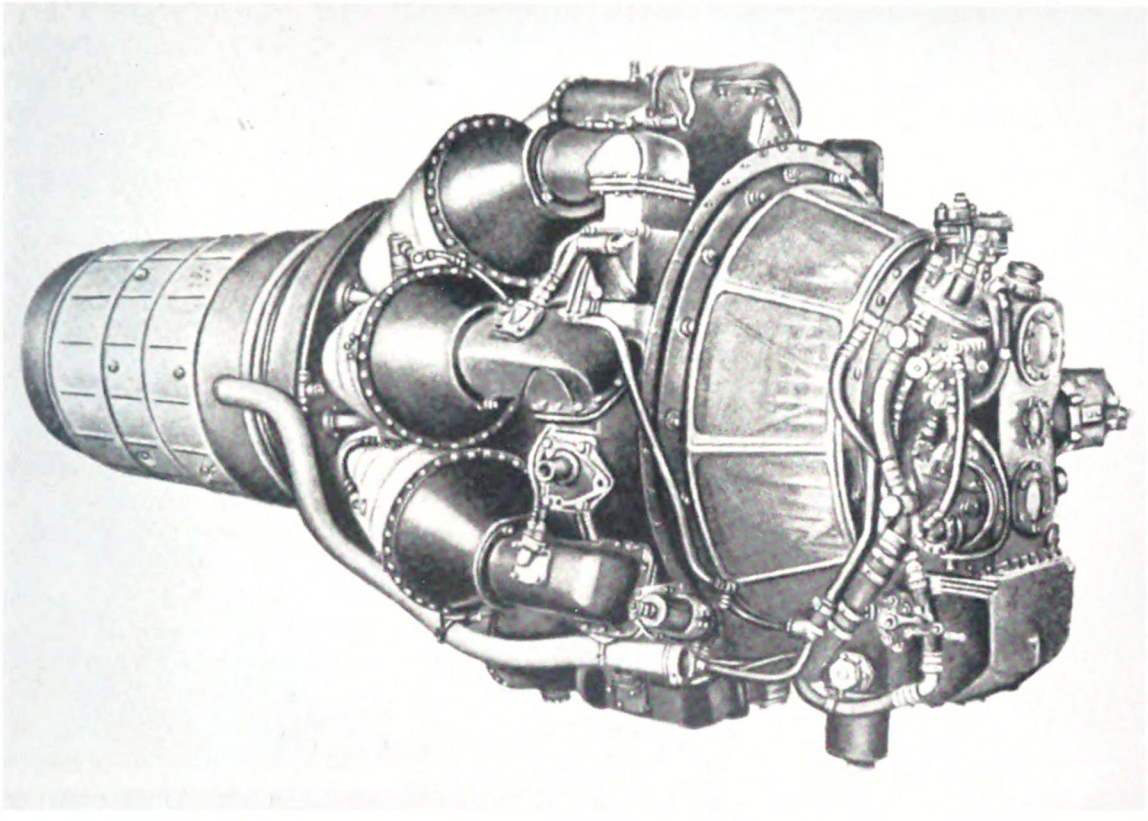
The Rolls-Royce Nene II turbojet suspended on a lifting fixture. Two such engines powered the IL-28 on its first flight.

children's playground, the gunner was to place his feet on the recessed boarding steps, facing forward, then grab hold of the actuating rams, lower himself through the hatch and let go.

Interestingly, when the navigator/bomb-aimer was in his ejection seat he was unable to reach the bomb sight! To use it, he had to unbuckle his seat harness, hooking it up to the hatch cover above his head, and move to a small jump seat on the starboard side of the extreme nose next to the sight. Of course, he was to be securely strapped in during take-off, landing and aerial combat when ejection might be required any moment.

A Nene II is bench-run at the Central Aero Engine Institute (TsIAM) during tests in the Soviet Union.



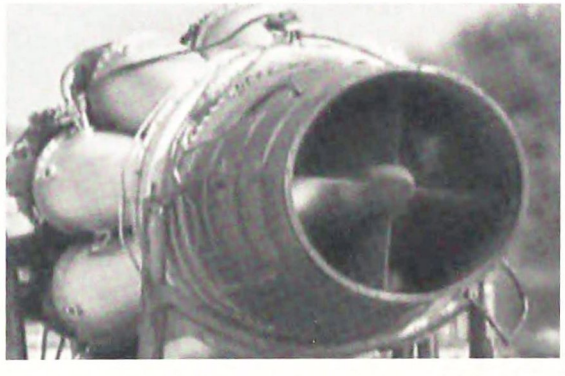


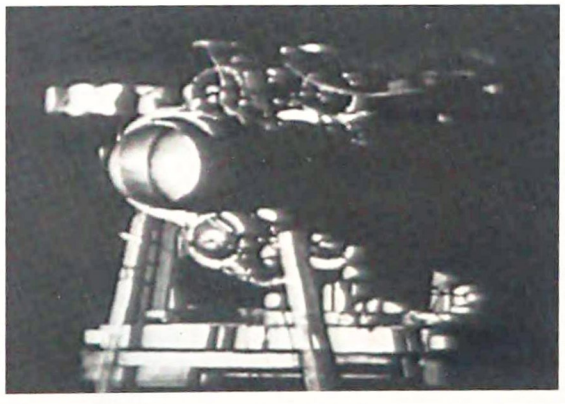
The Nene's Soviet twin – the Klimov RD-45F.

Secondly, careful analysis of combat experience with tactical bombers in the Great Patriotic War of 1941-45 and of the results obtained with the IL-22, as well as of the future IL-28's anticipated operating conditions, suggested that the bomber's flight performance and combat efficiency depended to a considerable degree on the chosen defensive weapons arrangement. After comparing several alternative armament arrangements the designers concluded that even a single tail turret, coupled with appropriate defensive manoeuvres, could ensure adequate protection against enemy fighter attacks in the rear hemisphere, providing that the cannons' traversing/elevating rates were increased and the effective field of fire was maximised (particularly in elevation). Besides, the use of only a single tail turret reduced empty weight and improved aerodynamic efficiency.

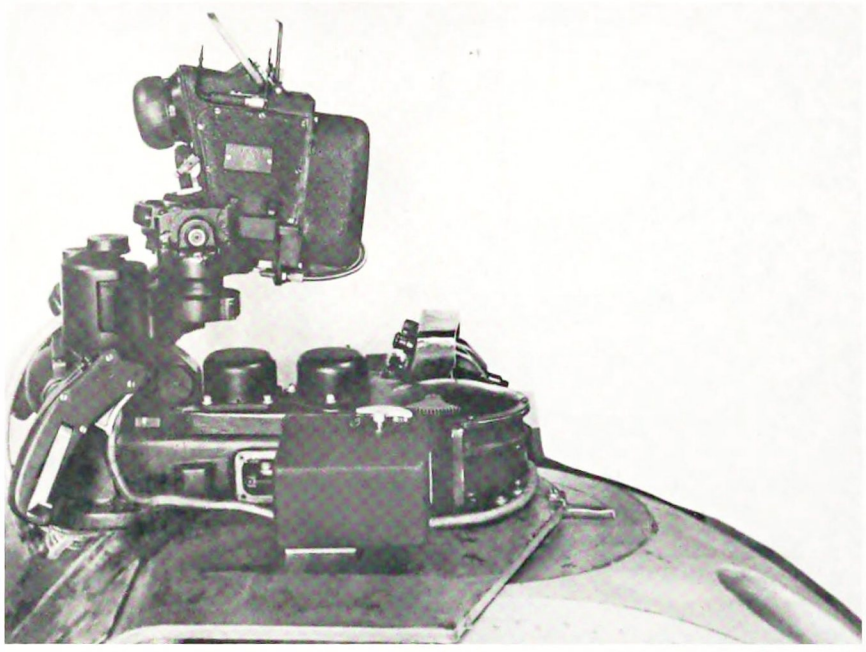
Hence General Designer Sergey V. Ilyushin formulated the requirements for a new tail turret. Yet creating this piece of equipment turned out to be quite a challenge; the designers had to meet stringent specifications while keeping the unit's weight to a minimum. Thus, as one Russian writer put it, the IL-28 was 'designed around the tail' – or, to be precise, the tail turret.

Since the IL-22's hydraulically powered KU-3 tail turret turned out to be too sluggish, a new power drive and remote control system had to be developed. The result was the highly efficient KU-6 electrohydraulically-powered remote-controlled 'ball' turret – the first of the kind in the Soviet Union; it was developed by the OKB's armament section headed by V. A. Fyodorov. (In production form the turret was designated IL-K6, the K once again standing for *kormo**va**ya* [*strel**kov**aya oosta**nov**ka*].) Originally it mounted the same NS-23





Rear views of the RD-45F being bench-run. Note the cruciform struts supporting the conical tail fairing of the turbine shaft.



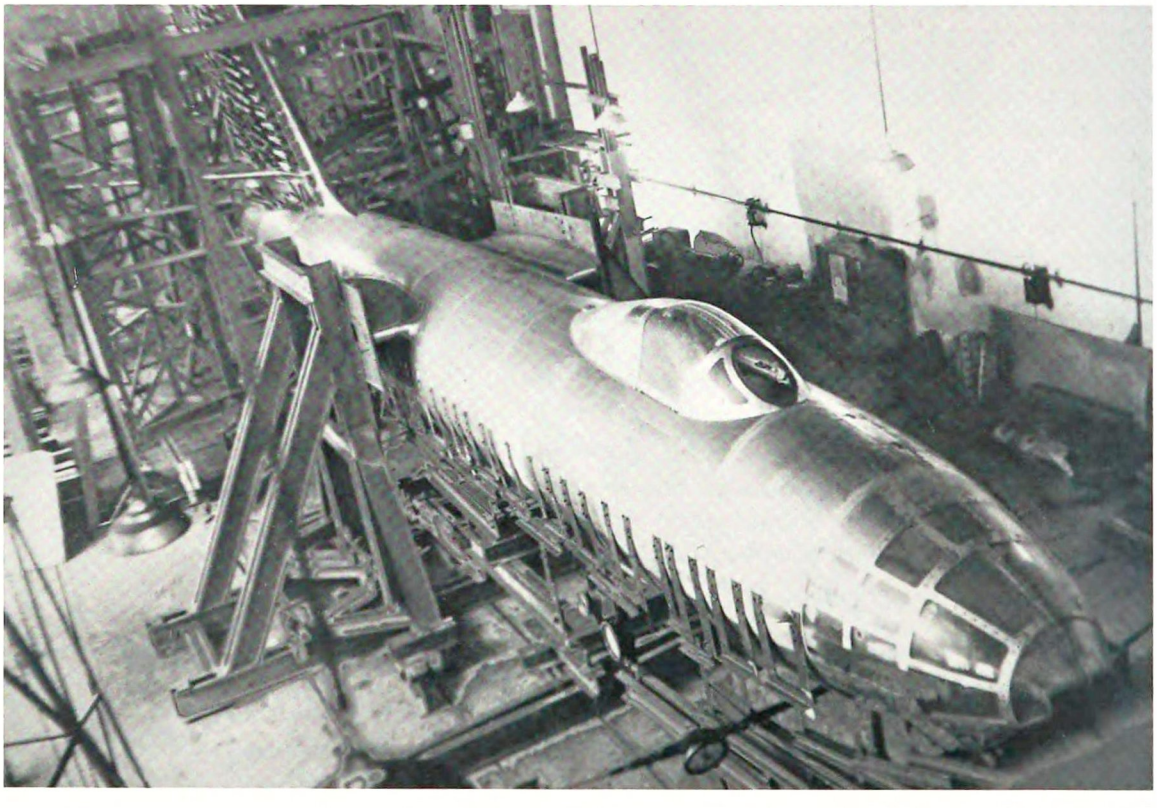
Close-up of the ASP-3P computing gunsight for the tail turret. Note the padded chin rest.

cannons; these were later replaced by Nudelman/Richter NR-23s with the same calibre but a much higher rate of fire (850 rounds per minute versus 550 rpm for the earlier model).

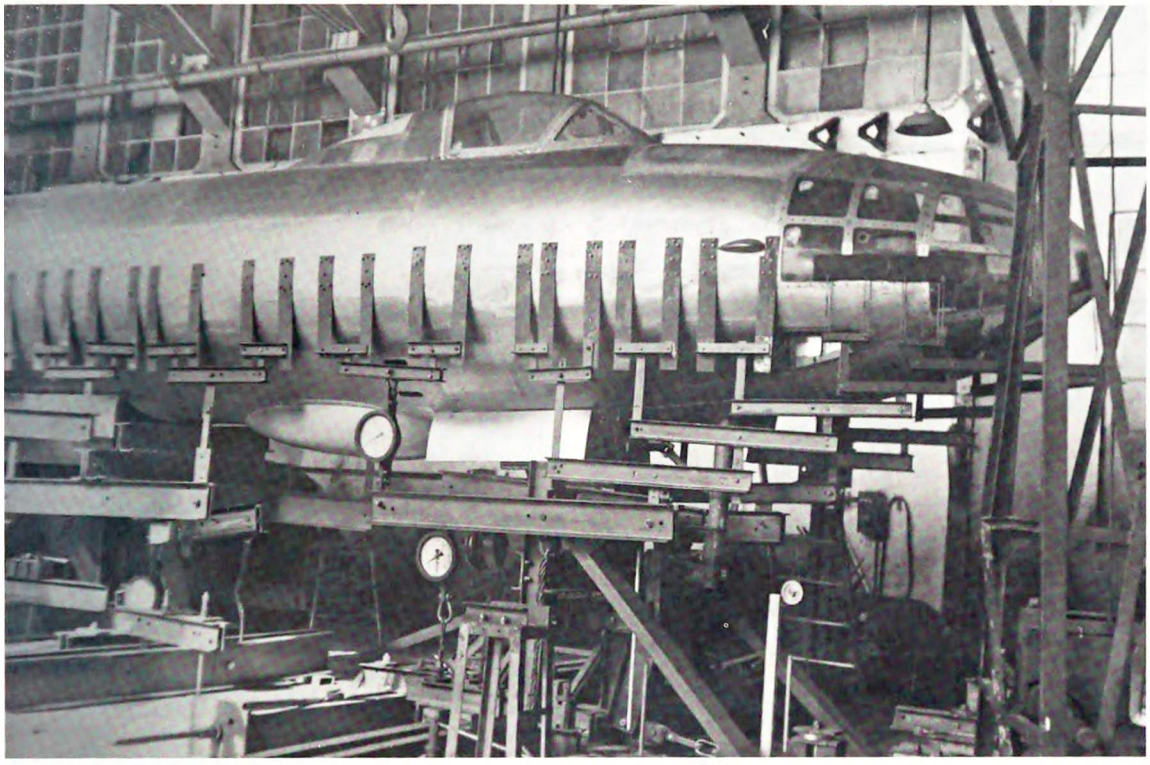
The IL-K6 had a traversing angle of ±70° and an elevating angle of +60°/–40°. In normal mode the cannons moved at a rate of 15-17° per second, the motion increasing to up to 36° per second in boost (emergency) mode. The power drive enabled the turret to operate adequately at true airspeeds in excess of 1,000 km/h (621 mph), developing a force of up to 170 kg-m (1,229 lb-ft). At 340 kg (750 lb), the turret was relatively lightweight. By comparison, the DK-3 tail turret used on the Tu-4 had traversing and elevating angles of only ±30° while weighing nearly 390 kg (860 lb), and its actuators developed a force of no more than 50 kg-m (361 lb-ft).

The IL-K6 had a self-contained hydraulic system; the power drive was built around an unorthodox AKP-4 swivelling hydraulic pump unit (*agre**gaht** ka**cha**yushchikhsya pomp*) driven by two 2.5-kW MP-2500 electric motors. The output of the pumps, and hence the cannons' traversing and elevation rate, depended on the tilt angle of the pump unit; with the AKP-4 in a neutral position the turret remained motionless. This made it possible to dispense with slide valves, reservoirs and other unreliable components, resulting in a simple and safe hydraulic system. The ammunition boxes were integral with the turret, allowing the customary belt feed and tightening mechanisms to be dispensed with, which again made for higher reliability; the ammunition supply was 225 rounds per gun.

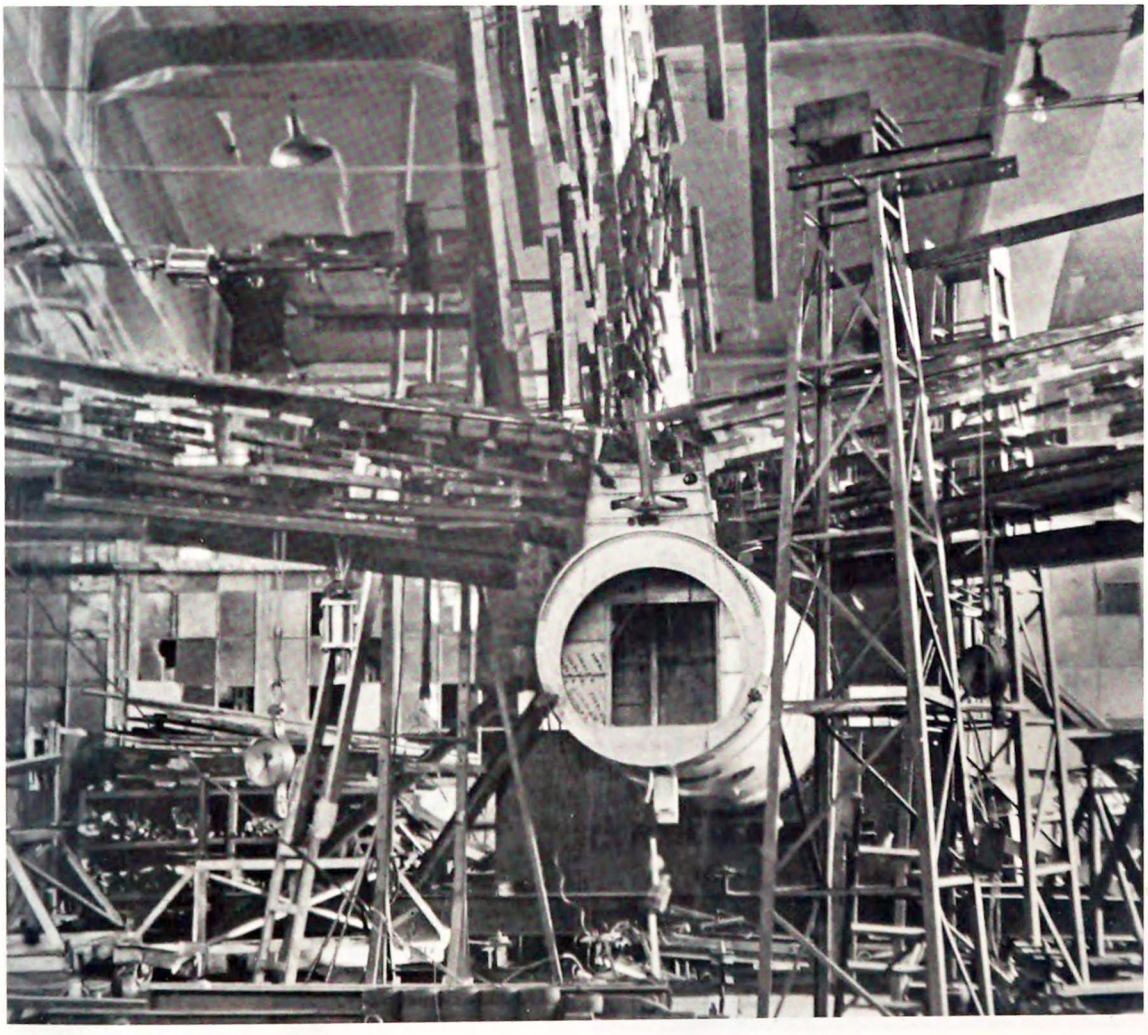
The turret was electrically controlled by means of a highly reliable and precise potentiometric tracking system. Targeting was done by an ASP-3P computing gunsight (*avtoma**tich**eskiy strel**ko**vyy pri**tsel*** – automatic gunsight) which automatically made adjustments for the target's motion, shell velocity and trajectory, cannon traversing angle, flight altitude and airspeed. The sight received feedback from the turret to minimise



An IL-28 fuselage in the static test rig at TsAGI. The short-span wing centre section integrated with the fuselage is clearly visible. The tail unit is almost hidden by the test fixture.

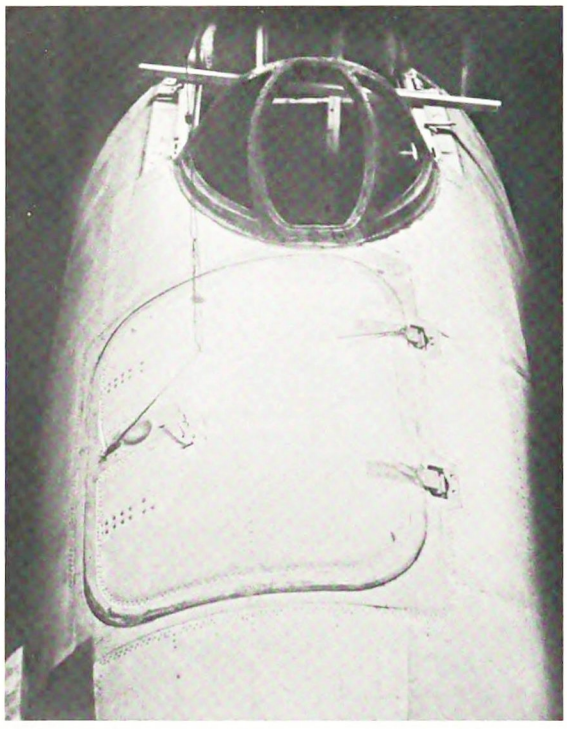


Another view of the same fuselage, showing the fixtures and the tension gauges.



Rear view of the same airframe, showing the aperture for the tail turret and the thicket of fixtures conveying the test loads to the tail surfaces.

Right: Upper view of the IL-28's nose section used for checking the navigator's entry hatch jettison system.

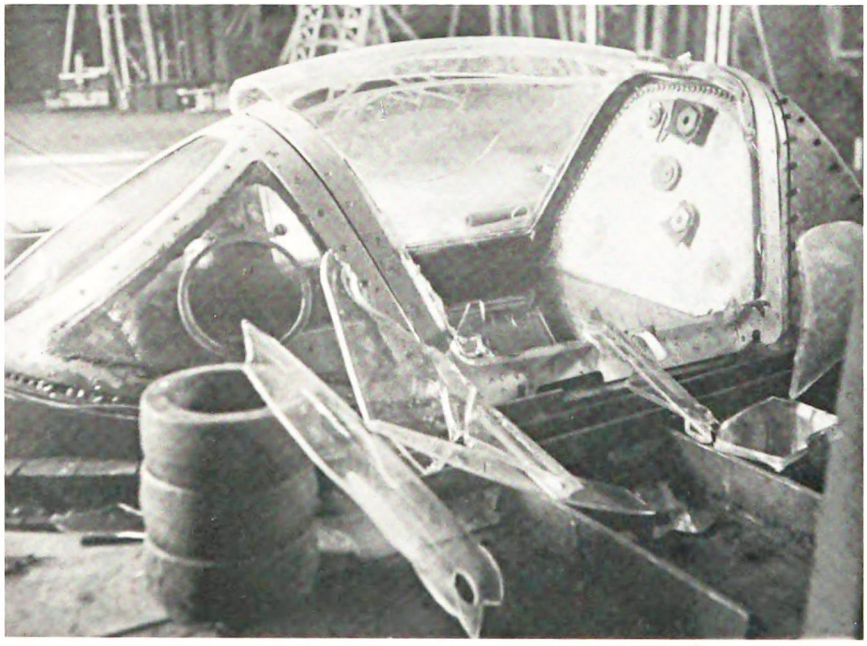


Far right: The same fuselage section after the hatch cover has been pyrotechnically jettisoned, hanging on a steel cable.

misco-ordination between the two; thus, misco-ordination in the horizontal plane was three times less than the limit set by general operational requirements of the time. To facilitate aiming and target tracking, the gunner's seat (or rather stool) was attached to an ingenious hydraulic mount slaved to the cannons, rising as the cannon barrels were lowered and vice versa.

Static tests of the pilot's cockpit canopy. The glazing of the hinged portion has fractured. Note the direct vision window in the port sidelight of the fixed windshield.

The defensive armament also included two fixed forward-firing NR-23 cannons with 100 rpg; these were installed low on the sides of the nose on quick-release mounts and could be removed by simply disconnecting an electrical coupling and turning a locking lever. The nose cannons were aimed and fired by the pilot, using a PKI-1 gunsight (*pri**tsel** kolli**mah**tornyy istre**bit**elya* – fighter-type collimator gunsight).



Thirdly, the decision to use only a single power turret and a three-man crew allowed the designers to make the IL-28 much more compact than the IL-22. The fuselage length was reduced by 3.45 m (11 ft 3 5/64 in) – from 21.1 to 17.65 m (from 69 ft 10 37/64 in to 57 ft 10⅞ in), the wing span by 1.65 m (5 ft 4 31/32 in) – from 23.1 to 21.45 m (from 75 ft 9 29/64 in to 70 ft 4 31/64 in) and the wing area by 13.7 m² (147.3 sq. ft) – from 74.5 to 60.8 m² (from 801.91 to 653.76 sq. ft), which led to a significant reduction in empty weight. Hence the fourth major difference was the powerplant; the projected size and weight allowed the new bomber to be powered by two Rolls-Royce Nene IIs rated at 2,270 kgp (5,000 lbst).

The Nene, for which the USSR had purchased a manufacturing licence in 1946, was reverse-engineered under the guidance of the well-known aero engine designer Vladimir Ya. Klimov, entering production in 1947 as the RD-45. By then the Nene had reached a high degree of reliability and boasted a 25-30% lower SFC as compared to the TR-1. On the other hand, a major drawback of this engine was its large diameter resulting from the centrifugal compressor. This, and the necessity to keep the air intakes as far away from the ground as possible in order to avoid foreign-object damage (FOD) – a must, since the aircraft was to operate from unpaved field airstrips – led the designers to mount the engines in conformal nacelles (without pylons).

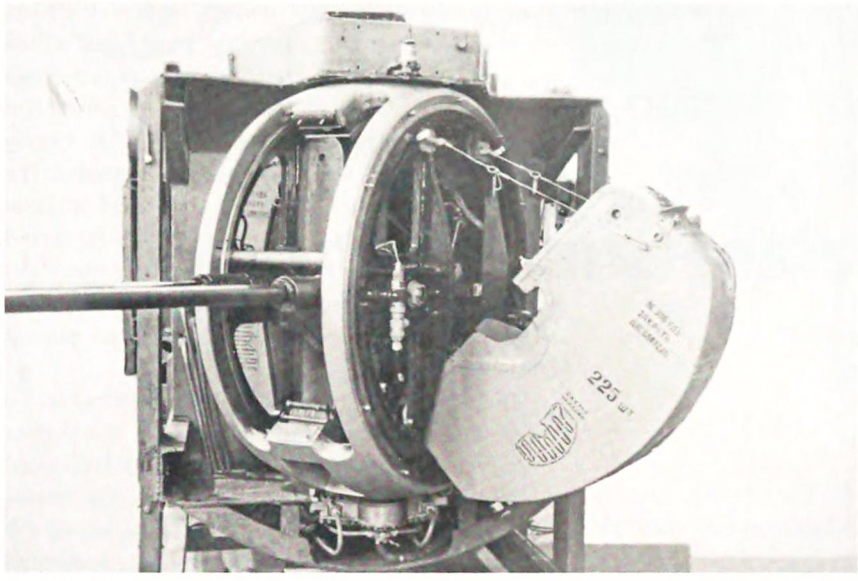
Once again, provisions were made for JATO boosters. These were of a different type than hitherto; the PSR-1500-15 boosters (*porokho**vaya** **star**tovaya ra**ket**a* – 'gunpowder', i.e., solid-fuel rocket booster)

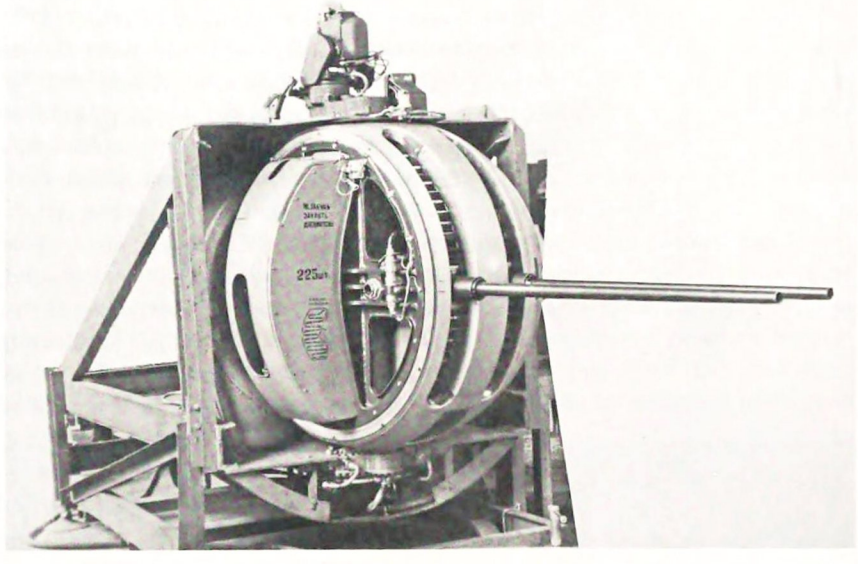
were specially developed for the IL-28 by OKB-81 headed by Ivan I. Kartukov. The boosters were attached under the wing roots, delivering a thrust of 1,600 kgp (3,530 lbst) with a 13-second burn time, and were jettisoned after burnout.

For centre of gravity reasons the engines were located well forward in the nacelles (so that the 'hot' section was ahead of the wing leading edge) and provided with long extension jetpipes protruding beyond the trailing edge. Therefore, the difference between the diameters of the engine's combustion chamber section and the jetpipe allowed the main gear units to be comfortably accommodated in the engine nacelles, giving a wide wheel track which was a bonus on semi-prepared strips. (In fact, it was the small diameter of the IL-22's engine nacelles leaving no room for the mainwheels that was the reason for the narrow-track fuselage-mounted main gear units on that bomber!) Again, the twin-wheel nose gear unit retracted aft and the single-wheel main units retracted forward. The main gear struts were attached by trusses to the wing structure, and as they retracted the large mainwheels turned through 90° by means of simple mechanical linkages to lie flat beneath the jetpipes (the Ilyushin OKB had first used this design on the wartime IL-10 *Bark* ground attack aircraft). Incidentally, here the designers made a virtue out of necessity in more than one way: the landing gear was noticeably taller than on the IL-22, giving a large ground clearance under the fuselage and easing the bomb loading procedure. In contrast, the IL-22 had a very small ground clearance requiring the aircraft to be jacked up when the largest compatible bombs – the 2,500-kg (5,511-lb) FAB-2500 and the FAB-3000 – were loaded.

The IL-28's wings were similar in planform to those of the predecessor, having zero leading-edge sweep, forward sweep on the tailing edge and squared-off tips. However, to meet the higher speed requirement they made use of a new TsAGI SR-5S high-speed airfoil developed under the guidance of Yakov M. Serebriyskiy and Maria V. Ryzhova – again with a 12% thickness-to-chord ratio. This enabled the bomber to reach a maximum speed of Mach 0.82 at 7,000-8,000 m (22,965-26,250 ft) without any adverse effects on stability and control characteristics caused by shock wave formation. The provision of simple slotted flaps assured the IL-28 good field performance, allowing operation from short tactical airstrips.

The high design speeds called for a swept tail unit which ensured good stability and handling throughout the speed range, delaying the onset of dangerous Mach buffeting to a speed well above the aircraft's never-exceed speed. In addition, the sweepback increased the rudder and elevator arm, which allowed the area and weight of the tail surfaces to be reduced. The vertical tail and horizontal tail had a sweepback at quarter-chord of 41° and 30° respectively. The tail surfaces utilised NACA symmetrical airfoils with a slightly higher thickness-to-chord ratio than those of the IL-22.





Top and above: Two views of the improved IL-K6M (known in production form as the IL-K6-51) on a test rig. Both ammo boxes are clearly visible, the stencils showing the capacity 225 rounds each) and the routing of the ammo belt. Note how the boxes hinged down for loading.

The manufacturing technique first used by OKB-240 on the IL-22 was used again and further refined. The IL-28's wings and tail surfaces had a manufacturing break along the chord line; each half of the subassembly consisted of three panels incorporating stringers and ribs. This allowed different panels to be manufactured concurrently at different workstations, saving time and improving working conditions at the same time – noisy and labour-intensive manual riveting was replaced with high-quality machine riveting which made up 75% of the riveting work.

The fuselage was divided into four sections, two of which were the pressurised compartments; again, for ease of assembly each of them was designed in port and starboard halves. All structural members of the fuselage

were readily accessible during section build-up, allowing riveting and assembly operations to be mechanised and various internal equipment to be fitted quickly and efficiently; this facilitated the installation of equipment in bays which would not be readily accessible once the structure was fully assembled. The centre fuselage had longitudinal recesses on both sides covered by removable skin panels, which facilitated both installation of wiring during assembly and maintenance and repairs in service. This feature reduced pre-flight check time and enhanced combat efficiency.

The slight weight penalty (about 4%) incurred by the new technology more than paid off. The surface finish was significantly improved; labour intensity was cut by 25-30% for production airframes and by 30-40% for internal equipment installation. As a result, the twinjet bomber was less complicated (and cheaper!) to build than a much smaller tactical fighter. Also, this allowed Ilyushin to avoid the tell-tale wing drop problem which affected some early Soviet jets.

Wartime operational experience with bombers had shown a pressing need for de-icing systems, and this was taken into account to give the IL-28 all-weather capability. The turbojet engines powering the aircraft could be fitted with air bleed valves and enabled the Ilyushin OKB to quickly create a hot air de-icing system – the most efficient kind at the time; engine bleed air passed between the double skins of the wing, fin and stabiliser leading edges, exiting through grilles at the tips. This was the Soviet Union's first hot air de-icing system; it was lightweight, reliable and simple to operate and had no parts disrupting the airflow. This feature greatly improved the bomber's combat efficiency and flight safety in adverse weather – particularly because the relatively thin airfoils used in the wings and tail unit made icing much more dangerous than in the case of slower piston-engined aircraft utilising thick airfoils.

All-weather and night flying capability was ensured by the provision of a comprehensive avionics suite enabling the crew to navigate the aircraft, detect, identify and destroy ground targets without maintaining visual contact with the ground. The avionics suite included an OSP-48 instrument landing system (ILS; OSP = *obo**roo**dovaniye sle**poy** po**sahd**ki* – blind landing equipment) for use in instrument meteorological conditions (IMC). The ground part of the system included two range beacons, three marker beacons, communications radios and an HF or VHF radio direction finder to facilitate approach and landing in bad weather. The system's components installed on the aircraft comprised an ARK-5 Amur (a river in the Soviet Far East; pronounced like the French word *amour*) automatic direction finder, an RV-2 *Kris**tall*** (Crystal) low-altitude radio altimeter and an MRP-48 ***Dya**tel*** (Woodpecker) marker beacon receiver. (ARK = *avtoma**tich**eskiy **rah**dio**kom**pas* – ADF; RV = ***rah**diovysoto**mer*** – radio altimeter; MRP = ***mar**kernyy **rah**diopri**yom**nik* – marker beacon receiver.) The OSP-48 ILS was fairly simple and had few components, which rendered the ground part suitable for use on *ad hoc* tactical airfields (in truck-mounted form). The aircraft was also equipped with an AP-5 autopilot and a ***Mag**niy*** (Magnesium) identification friend-or-foe (IFF) transponder.

Unlike the IL-22, the IL-28's normal bomb load was 1,000 kg (2,204 lb); the maximum bomb load remained the same at 3,000 kg (6,613 lb). Despite the narrower fuselage, the bomb bay was still capacious enough to take the FAB-3000M-46 bomb. It featured four bomb cassettes suitable for up to 12 bombs of 50-500-kg (110-1,102-lb) calibre and one beam-type bomb cradle designed for a single bomb of 1,000-3,000-kg calibre. Later, the conventional HE bombs would be complemented by tactical nuclear bombs – the Soviet nuclear programme was well advanced by then.

In visual meteorological conditions (VMC) the navigator/bomb aimer used an OPB-6SR optical bomb sight (*op**tich**eskiy pri**tsel** bombardi**rov**ochnyy, soprya-**zhon**nyy s ra**dah**rom* – optical bomb sight, linked to the radar) which enabled him to take aim automatically at stationary and moving targets in level flight. The OPB-6SR computed the sighting angles and released the bombs automatically at the proper moment by means of an electric release mechanism. The sight was gyrostabilised to prevent the aircraft's oscillations caused by turbulence and the like from affecting bombing accuracy and was linked to the autopilot; the latter feature allowed the navigator to set the aircraft's course during the bombing run and correct its heading, bypassing the pilot. In IMC, bomb-aiming was to be assisted by the PSBN search/bomb-aiming radar (*pri**bor** sle**po**vo bombome**tah**niya i navi**gah**tsii* – blind bombing and navigational device) with a 360° field of view. The radar, which was developed by the Moscow-based OKB-339 under Chief Designer Ghedaliy M. Koonyavskiy (it subsequently became NPO Fazotron; NPO = *na**ooch**no-proiz**vod**stvennoye obyedi**nen**iye* – 'Phasotron' Scientific & Production Association), was originally to be located in the rear fuselage just ahead of the gunner's station and enclosed by a dielectric fairing.

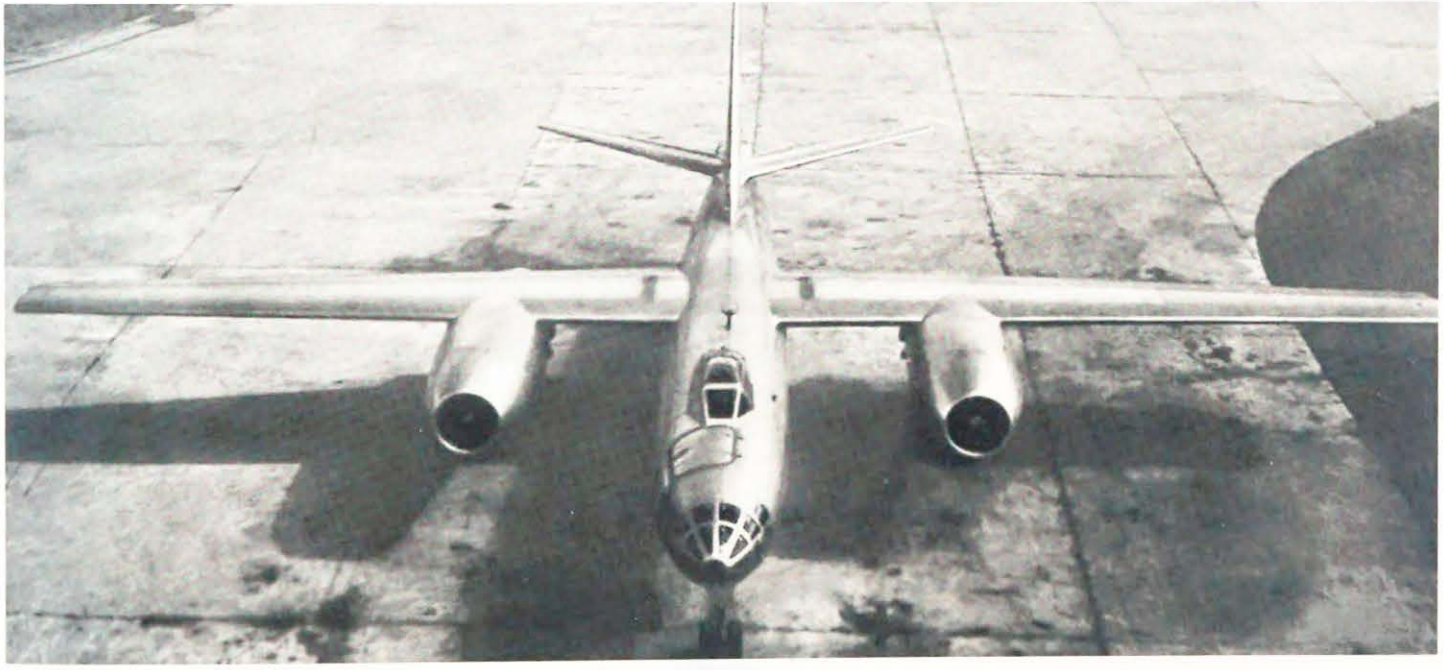
General Designer Sergey V. Ilyushin approved the IL-28 advanced development project (ADP) on 12th January 1948, giving the go-ahead to complete a set of manufacturing drawings and start prototype construction. It deserves mention that the execution of these drawings was the starting point in the designer's career of Ghenrikh V. Novozhilov, who became First Deputy General Designer in 1964 and subsequently head of OKB-240 in July 1970 after the founder's retirement due to failing health.

CHAPTER TWO

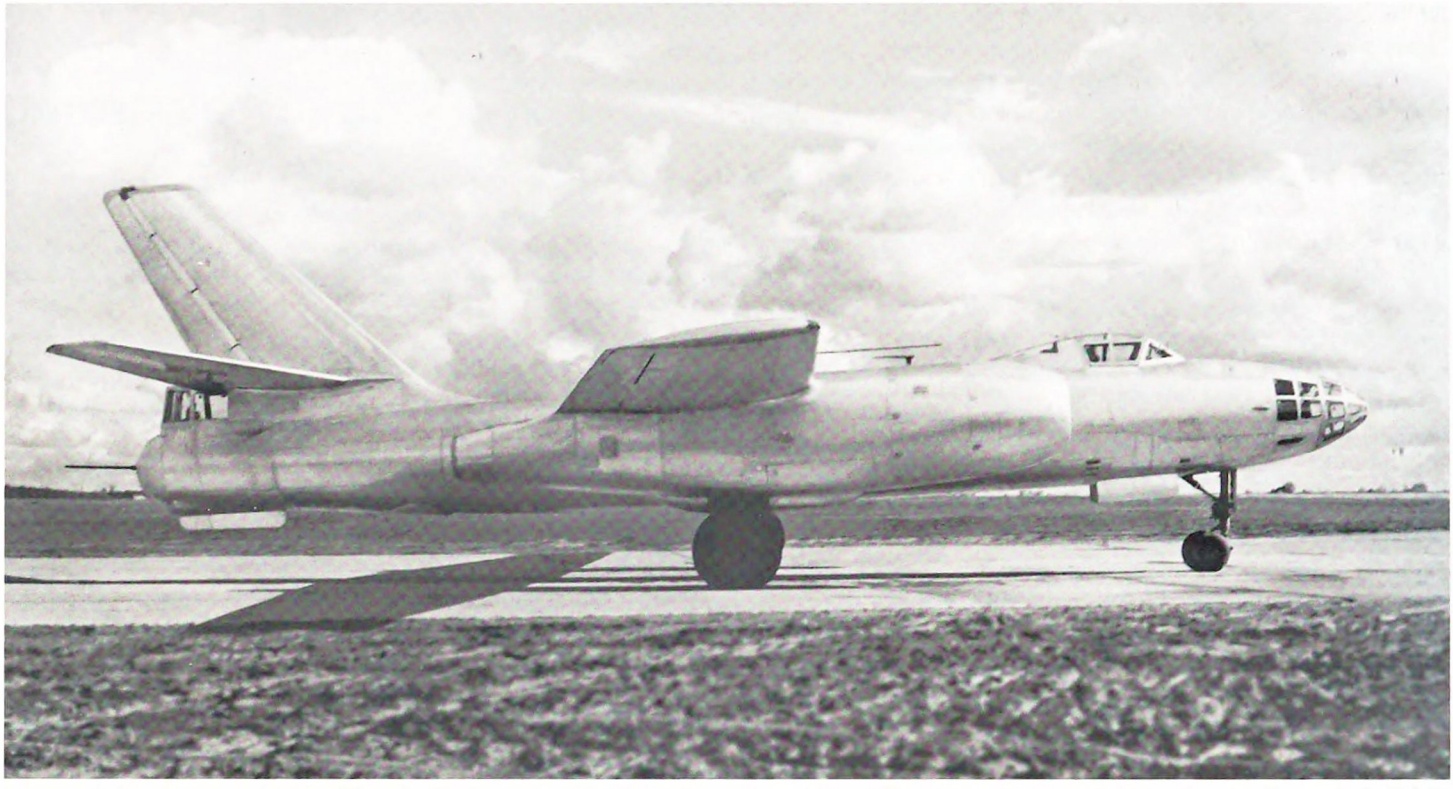
Prototypes and tests

By the time the IL-28's ADP had been endorsed and prototype construction begun, the Tupolev OKB – the Soviet Union's leading authority in bomber design – had received an official assignment to design and build a similar jet-powered tactical bomber. The Ilyushin OKB had no such assignment. Still, General Designer Sergey V. Ilyushin's belief in his aircraft was so strong that he decided to carry on with the IL-28 and build a prototype at his own risk – all the more so because the Soviet Air Force was in desperate need of a tactical bomber meeting the stringent new requirements. The IL-28 was not officially included into MAP's experimental aircraft construction plan until 12th June 1948 when the Soviet Union's Council of Ministers (i.e., government) issued directive No.2052-804 to this effect. This was just one month before the first prototype was rolled out at Moscow's Central airfield named after Mikhail V. Frunze (aka Moscow-Khodynka) where OKB-240 had its prototype manufacturing facility.

Bearing no serial or even national insignia, the first prototype (powered by authentic Rolls-Royce Nene turbojets imported from the UK) commenced ground tests on 29th May 1948. The aircraft had a few peculiarities distinguishing it from later IL-28s. Most notably, the fixed windshield of the cockpit canopy had an optically flat rectangular windscreen and optically flat triangular sidelights, while the hinged canopy portion had a plethora of longitudinal and transverse strips reinforcing the glazing; the navigator's station glazing had a thicket of frame members and the small foremost glazing panel was circular, just like on the IL-22. A dorsal 'forked' aerial on a short strut was installed immediately aft of the cockpit. The PSBN radar was missing, together with the radome (the cutout in the rear fuselage underside for the revolving radar antenna was closed by a flush-fitting cover); the reason was that the radar was not yet available in hardware form, and the initial flight tests would be concerned with performance and handing anyway. In anticipation of the radar's installation a long strake-like tail bumper was installed under the tail gunner's station to protect the radome in the event of a tailstrike, running all the way from the manufacturing break to the tail turret. (Speaking of which, the first prototype was equipped with the first example of the KU-6 turret which had previously passed bench tests; the second prototype of the KU-6



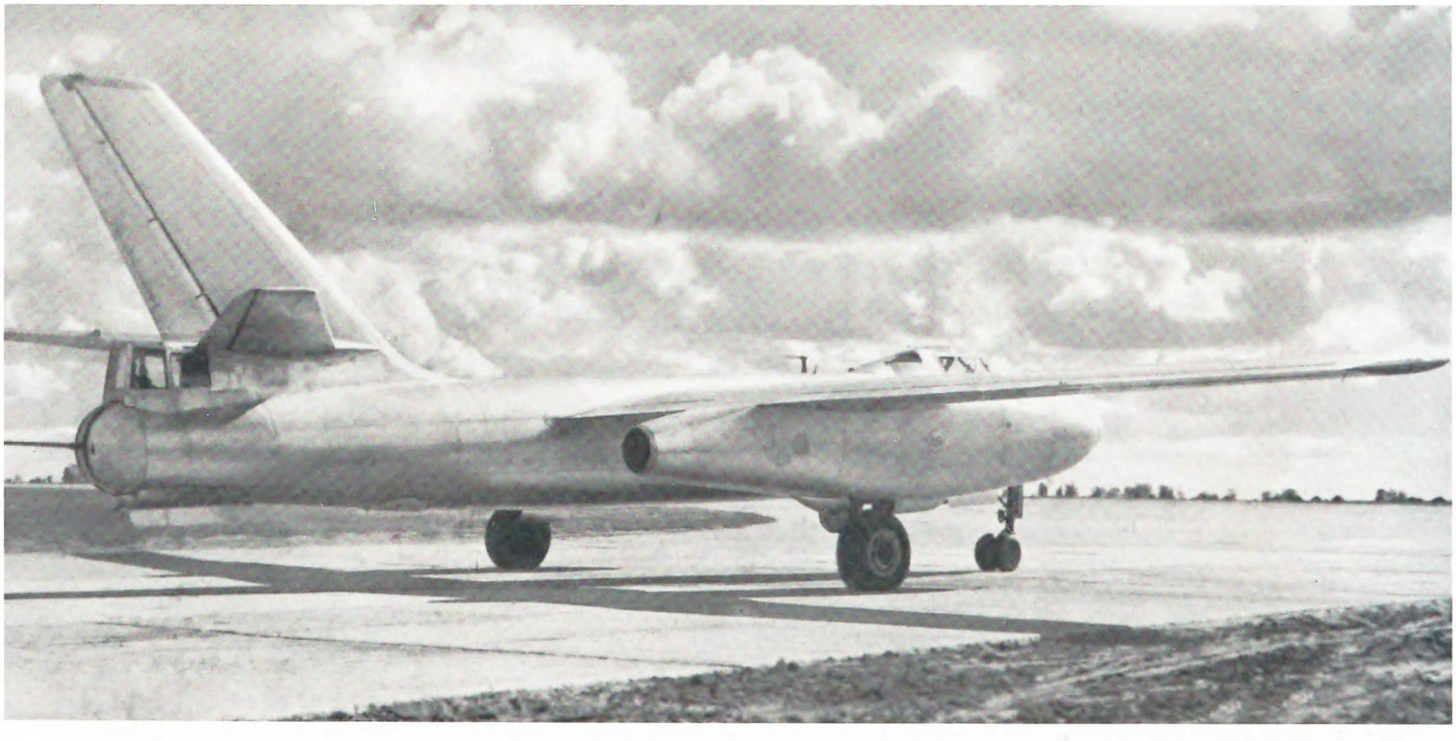
This view of the Nene-engined first prototype IL-28 shows that, unlike later examples, the engine nacelles were not area-ruled. Note the angular cockpit windshield, the offset entry hatch of the navigator's station and the metal strips sealing the wing centre section/outer wing joints.

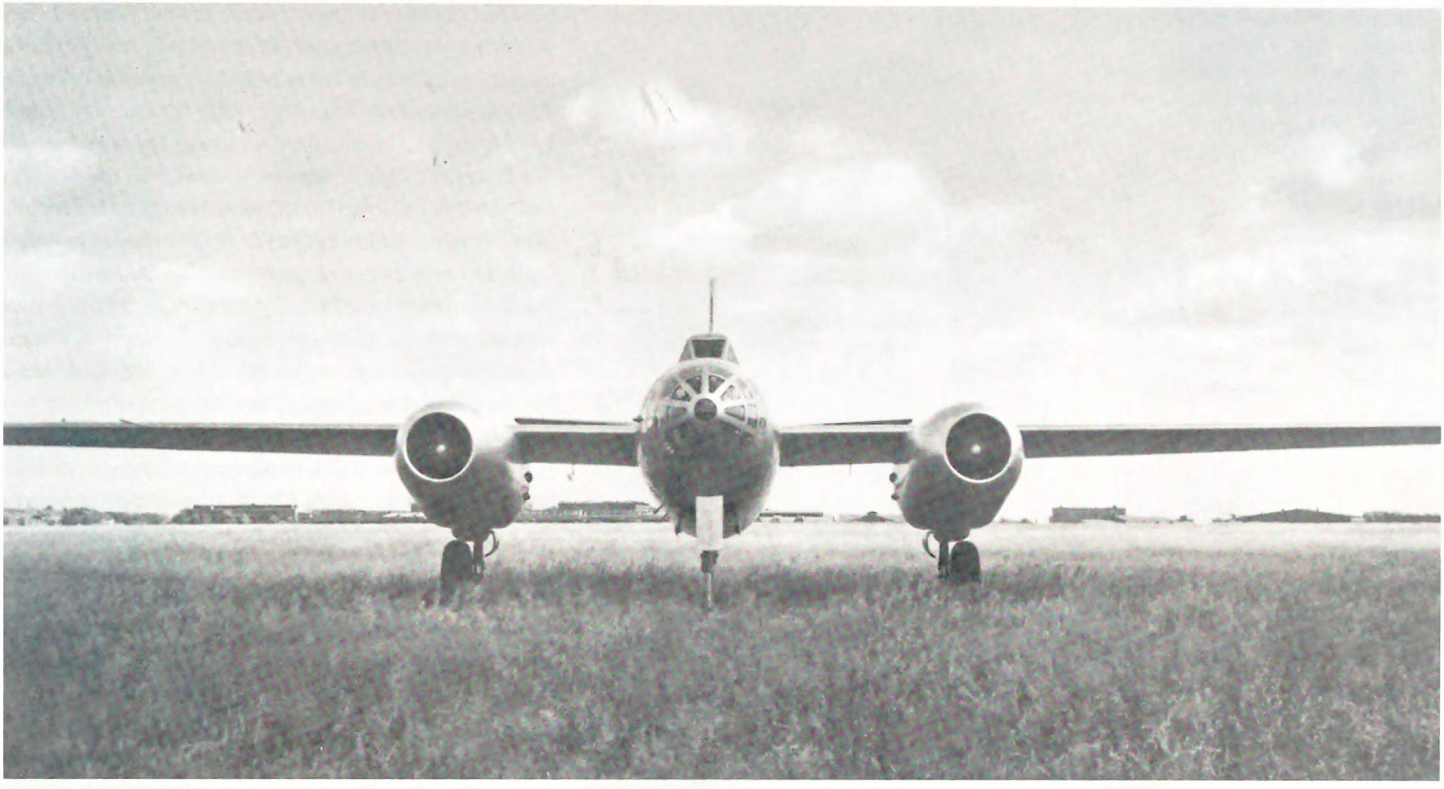


Two more aspects of the Nene-engined first prototype, showing the elaborate cockpit canopy framework, the dorsal ILS aerial, the pitot located at half-span, the absence of the radar and the long ventral strake.

was being ground-tested at the time and was intended for state acceptance trials.) The engine nacelles simply tapered off rearwards from their maximum cross-section. There were no landing lights.

(Speaking of serials, until the mid-1950s Soviet military aircraft wore three- or four-digit *serial numbers*. These allowed more or less positive identification, since they were based on the aircraft's construction number – usually the last one or two digits of the production batch number plus the number of the aircraft within the batch. In 1955, however, the Soviet Air Force (VVS – *Vo**yen**no-voz**doosh**nyye **see**ly*) switched (probably for security reasons) to two-digit *tactical codes* which were not based on the c/n; thus, lots of sister aircraft from different units had identical codes, making positive identification impossible. This system is still in use





today. Three- or four-digit codes are rare and are usually worn by development aircraft, in which case they tie in with the manufacturer's designation, c/n or fuselage number (line number), or by aircraft belonging to flying schools. On military transport aircraft, the occasionally seen three-digit tactical codes were the last three of the former civil registration (many Soviet/Russian Air Force transports were, and still are, quasi-civil). At the same time the star insignia on the fuselage were deleted, remaining on the wings and vertical tail only.)

On 1st July the aircraft was dismantled and trucked to the Flight Research Institute named after Mikhail M. Gromov (LII – ***Lyot****no-is****sled****ovatel'skiy insti****toot***) in Zhukovskiy south of Moscow where most Soviet aviation OKBs had their flight test facilities. Viktor N. Boogaiskiy was assigned engineer in charge of the aircraft.

As mentioned earlier, Sergey V. Ilyushin had promised that the maiden flight of the IL-28 would take place in July 1948. He was as good as his word: the bomber took to the air for the first time on 8th July 1948, flown by Ilyushin OKB chief test pilot Vladimir K. Kokkinaki; N. D. Sorokin was the flight engineer (*sic* – obviously the navigator) and B. A. Yerofeyev was the radio operator. V. V. Semyonov was the engineer in charge of the tests. Kokkinaki was pleased with the aircraft's handling, stating in the post-flight report that the IL-28 was easy to fly both during take-off and in cruise and climbed well.

The IL-28 exhibited good directional and lateral stability throughout its operational envelope. When properly trimmed the aircraft was stable in level flight even with the controls released. Low-speed handling was quite good, with no tendency to stall or spin. Straight and level flight with one dead engine was no problem either, the yaw being easily countered without excessive forces on the rudder pedals. The aircraft had good field performance and could operate from existing airbases and tactical airfields.

During manufacturer's flight tests the Nene-powered first prototype attained a top speed of 833 km/h (517 mph) at 5,000 m (16,400 ft) and reached Mach 0.79 at 7,000-8,000 m (22,970-26,250 ft). The test pilots reported that the aircraft behaved normally at

Above: Front view of the first prototype after a refit with RD-45Fs, showing the IL-22-style 'sunburst' design of the navigator's station glazing frame.

Below: The first prototype's port nacelle after re-engining with RD-45Fs and addition of landing lights. Note the closed mainwheel well doors.

Ilyushin OKB chief test pilot Maj.-Gen. Vladimir K. Kokkinaki with the two Gold Star Medals that went with his two HSU titles.

Opposite page, top: The port nacelle of the RD-45F-engined first prototype during manufacturer's tests with the first annular cowling section (the air intake assembly) removed.

Opposite page, centre and bottom: Here the same engine is shown with the second annular cowling section removed, exposing the combustion chambers and the engine bearer. The placement of the landing lights would change later.

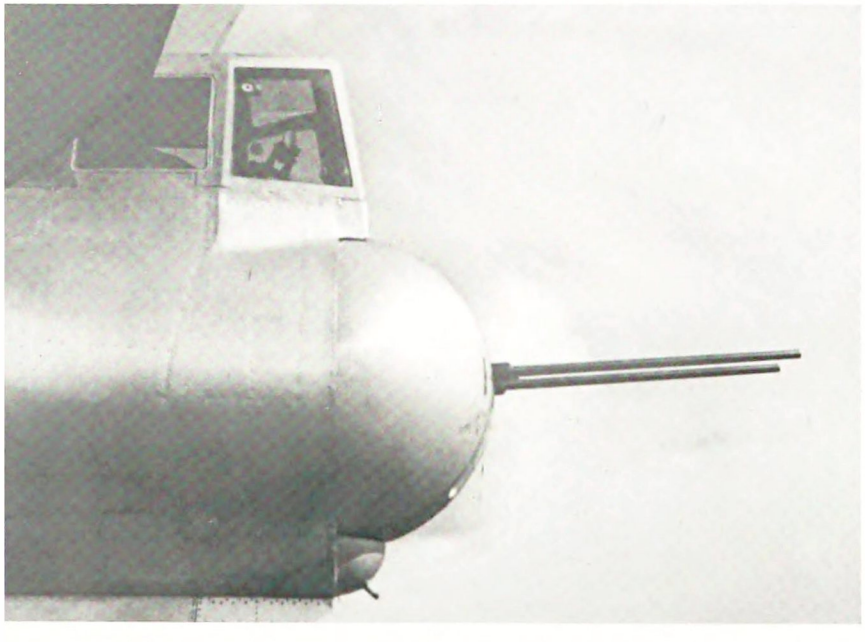
Below: The gunner's station and IL-KU6 turret of the RD-45F-engined first prototype during manufacturer's tests.

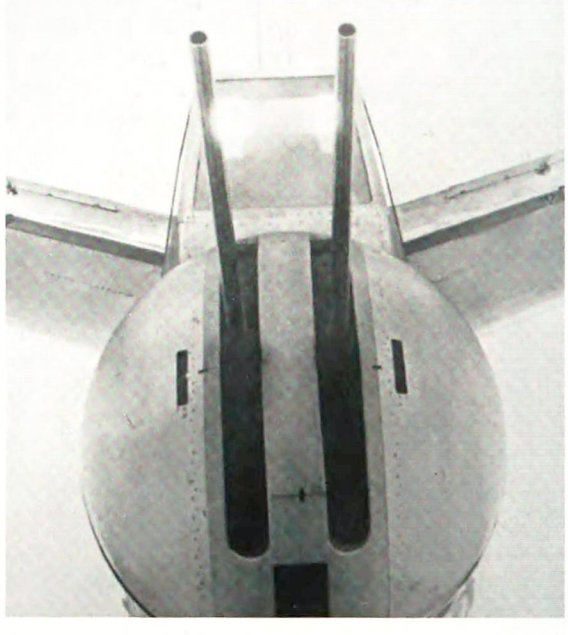
Below right: Rear view of the same turret, showing the spent case ejector aperture.

these speeds and could go even faster if appropriate changes were made. Hence the OKB set about streamlining the airframe and installing more powerful engines.

The Tupolev 'aircraft 73' tactical bomber prototype (Tu-73, aka Tu-20) and its 'aircraft 78' photo reconnaissance version (Tu-78, aka Tu-30) were undergoing manufacturer's flight tests at the same time – also at Zhukovskiy, of course. The Tu-73 basically shared the general arrangement of the IL-28 but only the horizontal tail was swept back. Another key difference was the powerplant. Since the Tupolev bomber was heavier than the IL-28, the two RR Nene IIs in wing-mounted nacelles were augmented by a 1,590-kgp (3,500-lbst) RR Derwent V in the rear fuselage breathing through an air intake built into the fin fillet and an S-duct. On the Tu-78 these were replaced by two RD-45Fs and one RD-500 respectively, the latter being the reverse-engineered version of the Derwent V. The third engine was, in effect, a booster, being used only for take-off and for a burst of speed over the target; nevertheless, provisions were made for four JATO boosters under the wings.

One day OKB-156 General Designer Andrey N. Tupolev saw the IL-28 prototype at the LII airfield. Being, by many accounts, a bad-tempered person and a man who did not take kindly to competition (to say the least), Tupolev was openly scornful at first. *'Humph! Whose bastard child is this?'* – he asked the technicians working on the aircraft. However, after examining the competitor's product closely and studying the specifications he had a long talk with his aides, berating them. The reason for Tupolev's displeasure was obvious: on the Tu-73/Tu-78 the designers had basically copied the defensive weapons arrangement of the piston-engined Tu-2, with dorsal and ventral remote-controlled twin-cannon barbettes and a waist gunner's station having lateral sighting blisters. This led to excessively large overall dimensions (the Tu-73 had a length of 20.32 m/66 ft 8 in and a wing span of 21.7 m/71 ft 2⅜ in), an excessively large crew of four and hence excessive weight (normal TOW, 18,151 kg/40,020 lb; maximum TOW, 23,917 kg/52,740 lb), not to mention the decidedly complex powerplant. (It may as well be said now that the definitive 'aircraft 81' tactical bomber (Tu-81, aka Tu-14) and 'aircraft 89' torpedo-bomber





(Tu-89, aka Tu-14T), codenamed *Bosun* by NATO, dispensed with the centre engine and the dorsal/ventral barbettes in favour of a single tail gunner's station, reducing the crew to three – a change no doubt inspired by the IL-28.)

On 30th December 1948 the first prototype IL-28 made its first flight after a refit with Soviet-built RD-45F engines – again with Vladimir K. Kokkinaki at the controls and Viktor N. Boogaiskiy as engineer in charge of the aircraft; A. P. Vinogradov was assigned engineer in charge of the flight tests. The engines (construction numbers 84506 and 84507) were apparently the sixth and seventh production examples manufactured by plant No.45 in Moscow (now called MMPP Salyut, *Mos**kov**skoye mo**tor**ostroi**t**el'noye proiz**vod**stvennoye predpri**ya**tiye* – 'Salute' Moscow Engine Manufacturing Enterprise). The tests of the engines continued until 27th January 1949. The purpose was to check both the aircraft performance and the operational parameters of the engines proper. The test report pointed out: *'The Chief Designer of plant No.45 shall be advised of the RD-45F engines' defects noted herein and shall take the following measures:*

1. Eliminate the [spontaneous] increase in engine rpm during climb and decrease in engine rpm during descent;

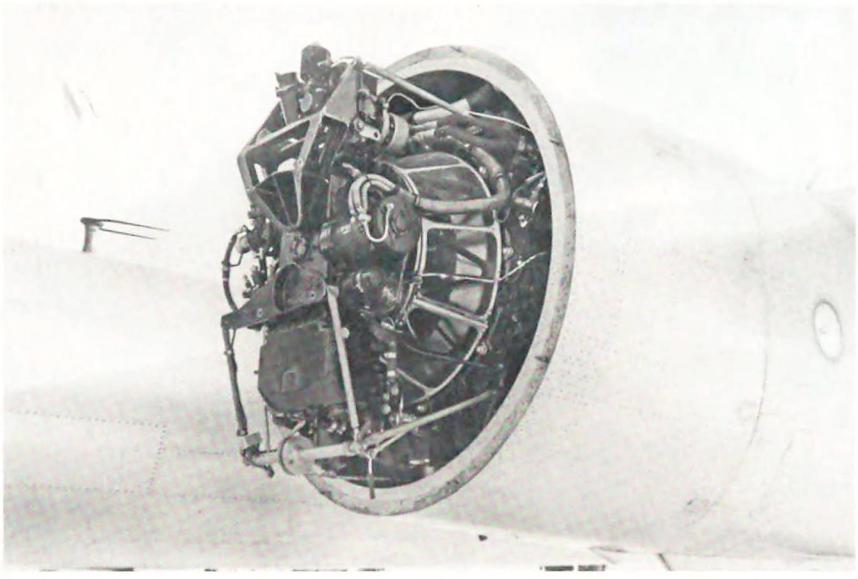
2. Make provisions for installing GS-9000 generators on the engines' accessory gearboxes (a different and less powerful generator had been used hitherto – *Auth.*);

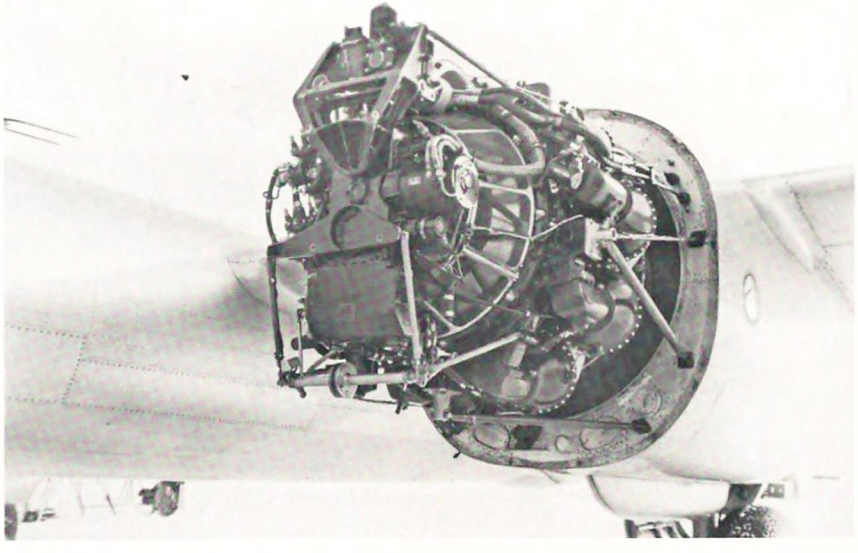
3. Enable self-contained engine starting (up to then engine starting had been performed by the ground personnel, using a control panel on the starter cart – *Auth.*).

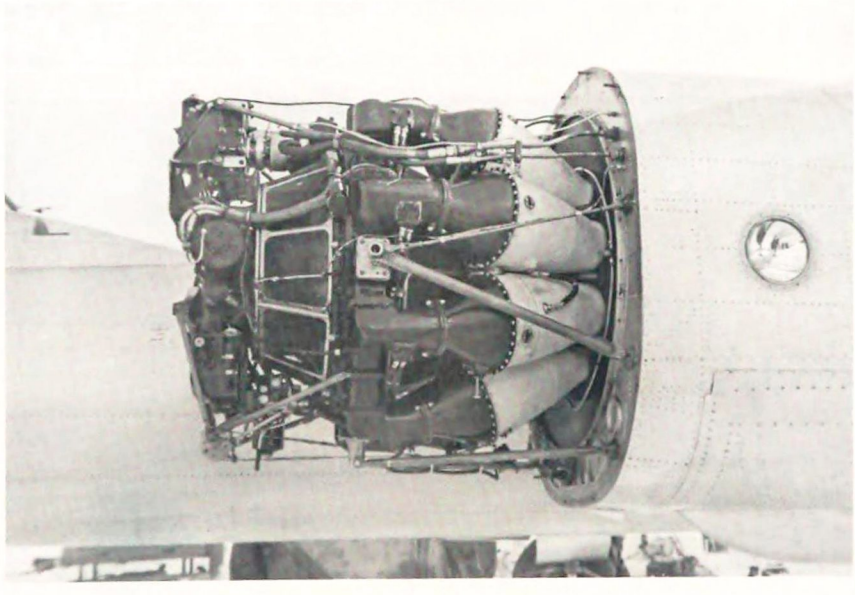
The Director of plant No.45 shall be advised of the considerable difference in the operating temperature of engines c/ns 84506 and 84507 which have been tested [on the IL-28].'

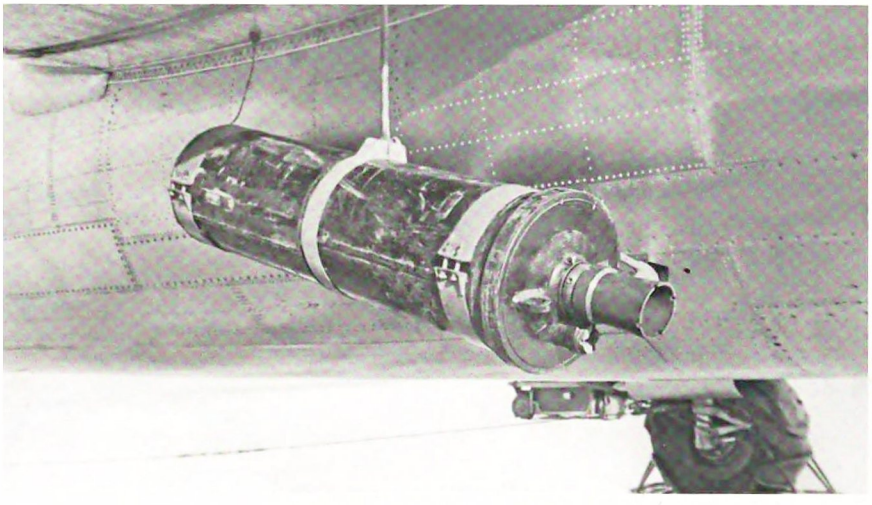
Apart from the engine change, the aircraft underwent a number of detail modifications at this stage. In particular, the cockpit canopy was revised – a more streamlined fixed windshield featuring an elliptical windscreen and curved triangular sidelights was fitted, while the hinged portion had a 'clean' transparency without the abovesaid reinforcing strips (the navigator's station glazing remained unaltered for the time being). A retractable thimble radome was fitted instead of the aforementioned cover but apparently the design proved unsatisfactory. Later it was replaced by a teardrop-shaped fairing under the rear fuselage; the greater part of it was dielectric, being the radome of the PSBN radar (the latter was not yet fitted). The strake below the tail gunner's station was shortened at the rear. Retractable landing lights were installed on the outer faces of the engine nacelles (just aft of the nacelle/cowling joint), as were cooling air scoops located at two-thirds of the nacelle's length.

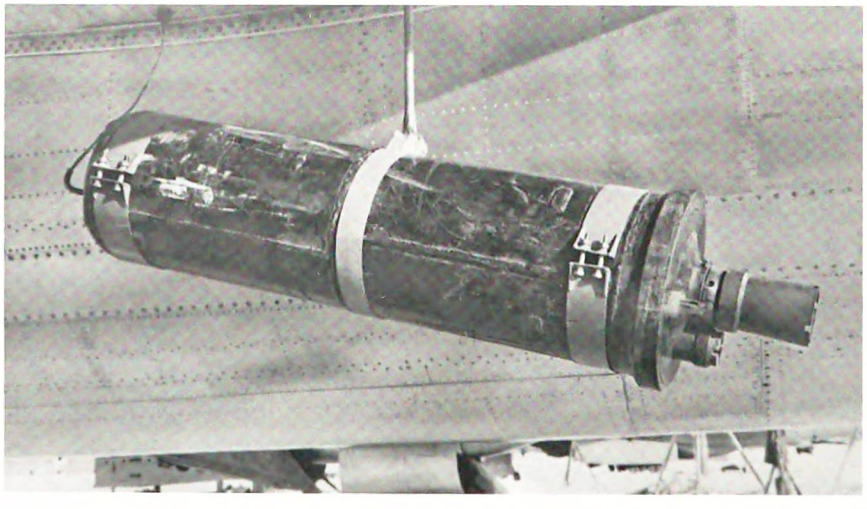
Tests of the PSR-1500-15 disposable JATO boosters on the RD-45F-powered first prototype were held in











1949 – again with Vladimir K. Kokkinaki as test pilot, Viktor N. Boogaiskiy as engineer in charge of the aircraft and A. P. Vinogradov as engineer in charge of the flight tests. A. V. Polyakov was seconded as engineer in charge by OKB-81. The boosters could be installed by three technicians within ten minutes by means of hand-cranked hoists, being mounted in a 15° nose-up attitude; to preclude damage to the airframe structure by the boosters' exhaust the nozzles were angled outward 6°. The PSR-1500-15 came with inter-changeable 'seasonal' nozzles, the nozzle for the hot season (the so-called summer mode) having a diameter of 75 mm (2 61/64 in) while the nozzle for the cold season (winter mode) had a diameter of 70 mm (2¾ in).

The purpose of the tests was to check the boosters' efficiency, the strength of their mountings and the reliability of their PP-253 igniters and the jettison system. According to the test report, all other conditions being equal, the boosters shortened the take-off run from 1,140 to 710 m (from 3,740 to 2,330 ft) and the take-off distance (up to an altitude of 25 m/82 ft) from 2,305 to 1,360 m (from 7,560 to 4,460 ft), which equals a reduction of 37.7% and 41% respectively. (One source claims that at a normal take-off weight of 17,220 kg (37,960 lb) the take-off run with boosters was just 560 m (1,840 ft)!) The effective operation time at ambient temperatures ranging from –2°C to +18°C (28.4-64.4°F) was 9-10 seconds; the actual burn time in both summer and winter mode was 12-14 seconds.

The report stated that the boosters' efficiency depended largely on the moment when they were ignited. Specifically, if the purpose was to reduce the take-off run on a short runway the boosters were to be ignited right after brake release. Conversely, if the purpose was to reduce the take-off distance in order to climb steeply and clear obstacles beyond the runway, it was best to delay booster ignition until the aircraft was airborne. The best results were achieved when the boosters were ignited as the aircraft accelerated to 100 km/h (62.1 mph); in this case they burned out 1-1.5 seconds after lift-off. Often there was a lag of 0.5-1 seconds between the two boosters' ignition, which had no adverse effect; nor had the failure of one booster to ignite, the aircraft remaining stable during the take-off run. The mountings and the jettison system proved reliable, but jettisoning the spent boosters at altitudes below 100 m (330 ft) was not recommended.

The conclusion was that the PSR-1500-15 had passed the tests with good results. OKB-81 Chief Designer Ivan I. Kartukov was instructed to develop an improved version of the boosters with an effective operation time of 18-20 seconds.

The IL-28 could easily operate from unpaved runways; in fact, the test pilots expressly *recommended* operating the bomber from dirt airstrips in order to prolong the tyres' service life. Speaking of which, new

The RD-45F-powered first prototype in further modified form during state acceptance trials at GK NII VVS (note the distinctive hexagonal pavement slabs at Chkalovskaya AB). The cockpit canopy has been revised and a radome has been added under the rear fuselage.

Three-quarters rear view of the same aircraft, showing the shape and position of the radome, as well as the shorter strake aft of it.

models of tyres were tested concurrently with the aircraft itself, as the durability of the original ones proved to be unsatisfactory – they were totally worn out after just ten landings on a concrete runway. The cause of the trouble was the tyres' substandard rubber. The best results were attained with tyres made of Perlon, a nylon-type synthetic rubber, which could withstand more than 100 landings.

Apart from the powerplant, the revised prototype differed from future production IL-28s in avionics and equipment. The aircraft was equipped with RSB-5 and RSU-10 radios, an SPUF-3 intercom, an AFA-33/50 or AFA-33/75 vertical camera (*aerofotoapparaht* – aerial camera) and an AFA-BA oblique camera, two GSN-3000 DC generators, three sets of KP-14 breathing apparatus (*kislorodnyy pribor* – oxygen equipment) with 8-litre (1.76 Imp gal) oxygen bottles, an RUSP-48 ILS (*rahdio'ustroystvo slepoy posahdki* – blind landing radio device) etc.

The manufacturer's flight test programme was successfully completed on 27th January 1949. Two weeks later, once the test reports had been filed, the first prototype was submitted for state acceptance trials at the Red Banner State Research Institute of the Air Force named after Valeriy P. Chkalov (GK NII VVS – *Gosudarstvennyy Krasnoznamyonnyy naoochno-issledovatel'skiy institoot Voyenno-vozdooshnykh sil*; the 'Red Banner' bit means the institute had been awarded the Order of the Red Banner of Combat). The trials commenced on 10th February, with Col. Mikhail P. Subbotin as project test pilot, Col. Fyodor M. Poptsov as navigator and V. A. Shoobralov as engineer in charge. Various other GK NII VVS test pilots, including Maj.-Gen. Pyotr M. Stefanovskiy, Col. Mikhail A. Nyukhtikov,

Opposite page, top: Two technicians move the port PSR-1500-15 JATO booster into position as it is lifted by a third technician working a hand-cranked hoist.

Opposite page, centre and bottom: The port JATO booster in place under the wing root of the RD-45F-powered prototype. Note the incline of the booster, the mounting struts and the ignition cable.

Specifications of the first prototype IL-28 during state acceptance trials

Length overall	18.0 m (59 ft 0²½ in) [1]
Height on ground	6.0 m (19 ft 8⅞ in)
Wing span	21.45 m (70 ft 4³¼ in)
Wing area	60.8 m² (653.76 sq. ft)
Wing loading	288 kg/m² (87.8 lb/sq. ft)
Power loading at sea level	3.38 kg/kgp (lb/lbst)
All-up weight:	
normal	17,500 kg (38,580 lb)
maximum	20,000 kg (44,090 lb)
Fuel load	6,300 kg (13,890 lb)
Maximum speed:	
at sea level	750 km/h (465 mph) [2]
at 5,750-6,000 m (18,860-19,685 ft)	843 km/h (523 mph)
at 10,000 m (32,810 ft)	820 km/h (509 mph)
Landing speed	178 km/h (110 mph)
Rate of climb:	
at sea level	10.9 m/sec (2,145 ft/min)
at 5,000 m (16,400 ft)	8.3 m/sec (1,633 ft/min)
at 10,000 m	3.6 m/sec (708 ft/min)
Time to height:	
to 5,000 m	8.6 minutes
to 10,000 m	22.6 minutes
Range:	
with maximum TOW, at 5,000 m and 542 km/h (336 mph)	1,815 km (1,127 miles)
ditto, at 10,000 m and 546 km/h (339 mph)	2,370 km (1,472 miles)
Endurance at 10,000 m cruise altitude and 546 km/h cruising speed	4 hrs 13 min
Take-off run	1,150 m/650 m (3,770 ft/2,132 ft) [3]
Take-off distance to h=25 m (82 ft)	2,540 m/990 m (8,330 ft/3,250 ft) [3]
Landing distance from h=25 m	1,730 m (5,680 ft) [4]

Notes:

1. Often stated as 17.65 m (57 ft 10⅞ in), which is the fuselage length (less the swept tail surfaces)
2. Speed limited at altitudes up to 1,750 m (5,740 ft) due to a 2,700 kg/m² (13,122 lb/sq. ft) dynamic pressure limit.
3. Without JATO boosters/with JATO boosters.
4. With a 13,500-kg (29,760-lb) landing weight.

Col. Valerian I. Zhdanov, Lt.-Col. Vasiliy M. Shool'gin and the institute's then-current chief Lt.-Gen. Oleg V. Tolstikov, also flew the aircraft, as did navigators Lt.-Col. N. P. Tsvetkov, Lt.-Col. Semyon S. Kirichenko, Vasil'yev and gunner/radio operator Shichkov.

The trials were rather brief, being completed on 30th April with satisfactory results; the aircraft logged 75 hours in the course of 84 flights. The official trials report was signed on 18th May 1949, and the conclusion stated in the report was favourable. Generally the bomber met both the manufacturer's estimates and the performance target stipulated by the abovementioned Council of Ministers directive No.2052-804; thus, as early as April 1948 it was recommended for production. It deserves mention, however, that the IL-28 was tested without the wingtip fuel tanks envisaged by the CofM directive; these were not introduced until the IL-28R reconnaissance version appeared (see Chapter 4). Also, the trials revealed 80 defects and shortcomings of varying seriousness which had to be eliminated.

The specifications of the RD-45F-powered first prototype IL-28 attained at the state acceptance trials are detailed in the table on this page. The table on page 31 gives a performance comparison of the IL-28 and Tu-14. Note that the figures stated for the IL-28 differ from those in the first table; however, in both cases they originate from official documents! A possible explanation is that different examples of the bomber were involved – or that whoever prepared the comparative table was not very honest, 'doctoring' the figures in favour of the IL-28.

The Tu-14 was being tested concurrently; the Powers That Be were to choose between the two, so that in effect Ilyushin and Tupolev had a fly-off, even though the term was unknown in the Soviet Union at the time. Hence the VVS top brass was in turmoil; some of the generals and marshals lobbied for the Tu-14, which had somewhat longer range, while others supported the IL-28, which was much easier to build and operate. The discussion raged on at the ministerial level; GK NII VVS chief Lt.-Gen. Oleg V. Tolstikov denounced the IL-28, strongly urging Minister of Defence Nikolay A. Bulganin to give the go-ahead for the Tu-14. However, even Bulganin failed to resolve the issue.

Eventually, on 14th May 1949 a special commission chaired by none other than Soviet leader Iosif V. Stalin convened to analyse the test results and compare the two types' performance. According to Sergey V. Ilyushin, after examining the reports carefully and listening to his military advisors Stalin picked the IL-28. As a 'consolation prize', Tupolev was requested to develop a torpedo-bomber version of the Tu-14 powered by two Klimov VK-1 turbojets with a single tail barbette for the Naval Aviation. The VK-1 was a version of the RD-45F uprated to 2,700 kgp (5,950 lbst).

However, Ilyushin was requested to increase the speed of the production bomber pronto to 900 km/h (559 mph) by re-engining the IL-28 with the more powerful and fuel-efficient VK-1s and submit the aircraft for a new round of state acceptance trials. Council of Ministers directive No.1890-700 to this effect was issued that same day; makes you wonder if the pro-Ilyushin lobby had prepared the directive in advance, anticipating this victory!

Building on the results of numerous wind tunnel tests at TsAGI, the Ilyushin OKB developed new engine nacelles for the VK-1-powered form of the IL-28. Unlike the first prototype's nacelles which were bulged around the middle, the new ones were distinctly area-ruled, the

'waist' being narrowest where the wing section was at its thickest. This significantly reduced harmful interference between wing and nacelle, especially at transonic speeds, resulting in a major improvement in the IL-28's performance. (As a point of interest, in the USA the area rule was formulated in parallel by the American aeronautical engineer Richard T. Whitcomb but did not find practical use until 1954 when Convair brought out the F-102 Delta Dagger interceptor.)

The likewise unserialled second prototype IL-28 powered by VK-1s commenced flight tests on 8th August 1949; the crew was the same as on the day of the type's maiden flight a year earlier. Apart from the engines, this aircraft introduced further detail changes. In addition to the revised cockpit canopy as described above, the navigator's station glazing was modified to improve the navigator's field of view: the lateral and upper glazing consisted of fewer panels, which had a larger size, and the circular foremost transparency above the optically flat elliptical window for the bomb sight gave place to a large crescent-shaped blown transparency. This glazing design was later standardised in production. The PSBN-M radar was relocated to a position immediately after the nosewheel well in order to improve its operating conditions (that is, reduce the danger of a tailstrike and increase the field of view) and enclosed by a fully dielectric teardrop-shaped radome, its former position being used for an avionics bay access hatch. (Again, on the second prototype the radar was not yet fitted; it was not until the end of 1949 that plant No.339 manufactured the first batch of PSBN-M radars.) The tail bumper was deleted at the same time as unnecessary. An aerial mast was installed aft of the cockpit instead of the forked aerial.

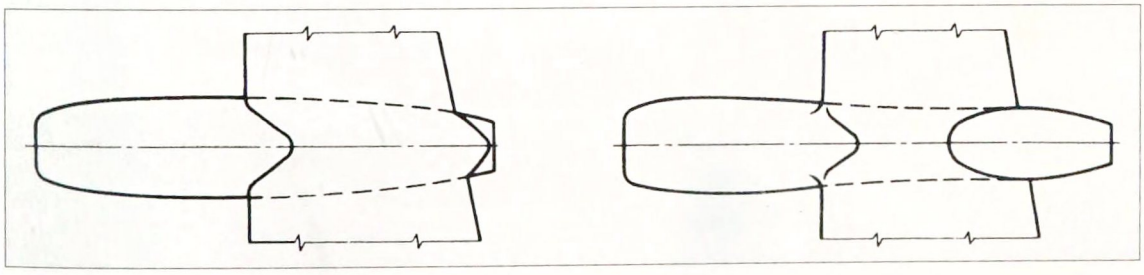
Other changes made after the first prototype's state acceptance trials included an enlarged rudder horn balance to reduce the rudder pedal forces. Some minor changes were made to the hydraulic system and the landing gear retraction system – in particular, the larger mainwheel well doors, which previously opened only when the gear was in transit, now stayed open when the gear was down (this was meant to reduce the gear retraction time). The bag-type fuel tanks in the fuselage were equipped with an inert gas pressurisation system to reduce the danger of explosion if hit by enemy fire, enhancing survivability; the system used bottled carbon dioxide.

A performance comparison of the Tu-14 and IL-28 prototypes

	Tu-14 ('73')	IL-28
Empty weight, kg (lb)	14,940 (32,940)	12,795 (28,210)
All-up weight, kg (lb):		
normal	21,000 (46,300)	18,400 (40,560)
in overload configuration	25,350 (55,890)	21,069 (46,448)
maximum	25,350 (55,890)	23,069 (50,875)
Maximum speed at take-off power/ normal AUW, km/h (mph):		
at 5,000 m (16,400 ft)	845 (524)	893 (554)
at 10,000 m (32,810 ft)	811 (503)	850 (527)
Maximum speed at take-off power/ normal AUW, km/h (mph):		
at sea level	774 (480.7)	800 (496)
at 5,000 m	823 (511)	857 (532)
at 10,000 m	773 (480)	823 (511)
Service ceiling at normal AUW, m (ft)	11,200 (36,745)	12,300 (40,350)
Maximum range at 10,000 m/ normal AUW, km (miles)	2,870 (1,782)	2,415 (1,500)
Take-off run, m (ft)	1,200 (3,940)	965 (3,170)
Landing run, m (ft)	1,100 (3,610)	960 (3,150)
Bomb load, kg (lb):		
normal	1,000 (2,204)	1,000 (2,204)
maximum	3,000 (6,613)	3,000 (6,613)

At a normal take-off weight of 18,400 kg (40,560 lb) the second prototype had a top speed of 800 km/h (496 mph) at sea level and 906 km/h (562 mph) at 4,000 m (13,120 ft). The pilots noted the aircraft was stable at any speed; control forces could be trimmed down easily. At the maximum permissible speed of Mach 0.78 the back pressure on the control column gradually increased; then, if elevator trim remained unchanged, the load reversed, the control column would move forward and the aircraft would tend to go into a dive. If elevator trim was selected up the aircraft could reach Mach 0.81-0.82, but this caused severe Mach buffet, warning the pilot to slow down.

With a 1,000-kg (2,204-lb) normal bomb load and a 21,000-kg (46,300-lb) MTOW the VK-1 powered IL-28 had a maximum range of 2,455 km (1,525 miles) and a service ceiling of 12,500 m (41,010 ft). The take-off run and landing run at normal weights did not exceed 880 m (2,890 ft) and 920 m (3,020 ft) respectively. The aircraft was easy to master for average-skilled flight and ground crews and was generally superior in



This drawing gives a comparison of the first prototype's engine nacelles with RR Nene II (and later RD-45F) engines (left) and the area-ruled nacelles with VK-1 engines introduced on the second prototype IL-28.

This page: The VK-1-engined second prototype IL-28 during state acceptance trials. The area-ruled engine nacelles and the revised navigator's station glazing are evident.

Opposite page: More views of the same aircraft, showing the radar relocated to the forward fuselage, the open mainwheel wells and the absence of the strake under the rear fuselage.

performance to the Tu-2 which was the mainstay of the Soviet Air Force's tactical bomber force at the time.

On 27th August 1949 the production-standard VK-1 powered aircraft was handed over for renewed state acceptance trials and passed them with flying colours. The trials involved 35 flights with a total time of 34 hours; once again, Mikhail P. Subbotin was project test pilot, with Fyodor M. Poptsov as navigator and Shichkov as GRO.

The GK NII VVS trials report read: *'The IL-28 prototype aircraft powered by VK-1 engines meets the performance target stipulated in the Council of Ministers directive of 12th June 1946. The trials have shown that the IL-28 [...] with the previously noted defects rectified [...] meets the requirement for a jet tactical bomber and can be recommended for production and service.*

We consider it necessary to equip the IL-28 [...] prototype [...] with wing and tail unit de-icers (the envisaged de-icing system was still missing at the time of the trials! – *Auth.*), *reduce the elevator control forces, provide the cockpit with glazing that does not distort the view, install landing gear wheels meeting the tyre pressure and temperature requirements, and introduce measures allowing the aircraft to land at night, using only the landing lights* (that is, without requiring the runway to be illuminated by parachute-retarded flares or searchlights – *Auth.*). *We deem it advisable to develop a trainer version of the production bomber by installing a second set of flight controls at the navigator's station.'*

The trials were not altogether without incident. Viktor N. Boogaiskiy recalled that on one occasion the first prototype suffered a brake failure due to a burst air

Right: GK NII VVS test pilot Col. Mikhail A. Nyukhtikov.

Centre right: GK NII VVS test pilot Lt.-Col. Vasiliy M. Shool'gin

Far right: GK NII VVS test pilot Maj.-Gen. Pyotr M. Stefanovskiy.

Right: GK NII VVS Chief Lt.-Gen. Oleg V. Tolstikov.

Centre right: GK NII VVS test pilot Col. Valerian I. Zhdanov.

Far right: GK NII VVS test navigator Col. Fyodor M. Poptsov. All of them participated in the IL-28's state acceptance trials.

pipeline when landing at Chkalovskaya airbase (the GK NII VVS test facility a short way east of Moscow). Test pilot Vladimir K. Kokkinaki forgot where the emergency brake handle was; as a result, the aircraft overran and ended up in the sand trap beyond the runway – fortunately without suffering any damage. On another occasion the gunner inadvertently snagged the entrance hatch operating handle with his boot during the take-off run – and fell out when the hatch opened, tumbling along the runway; luckily he did not suffer serious injuries. After this the hatch was modified to prevent such incidents, featuring a recessed handle.

On 16th September 1949 the State Commission recommended that production be started forthwith, and so it was (see Chapter 3). However, the state acceptance trials continued; in October 1950 the IL-28 was tested with a 2,000-kg (4,410-lb) bomb load, followed by trials with a 3,000-kg (6,613-lb) maximum bomb load in November and a full fuel load in December.

The production-standard IL-28's speed performance at various altitudes as recorded during the state acceptance trials

Altitude	Indicated airspeed: at cruise power	at full military power	Mach number: at cruise power	at full military power
sea level	786 km/h (488 mph)	800 km/h (496 mph)	0.642	0.655
4,500 m (14,760 ft)	846 km/h (525 mph)	900 km/h (559 mph)	0.73	0.776
5,250 m (17,220 ft)	848 km/h (526 mph)	897 km/h (557 mph)	0.738	0.782
8,000 m (26,250 ft)	837 km/h (519 mph)	876 km/h (544 mph)	0.759	0.79
12,000 m (39,370 ft)	710 km/h (441 mph)	805 km/h (500 mph)	0.67	0.757

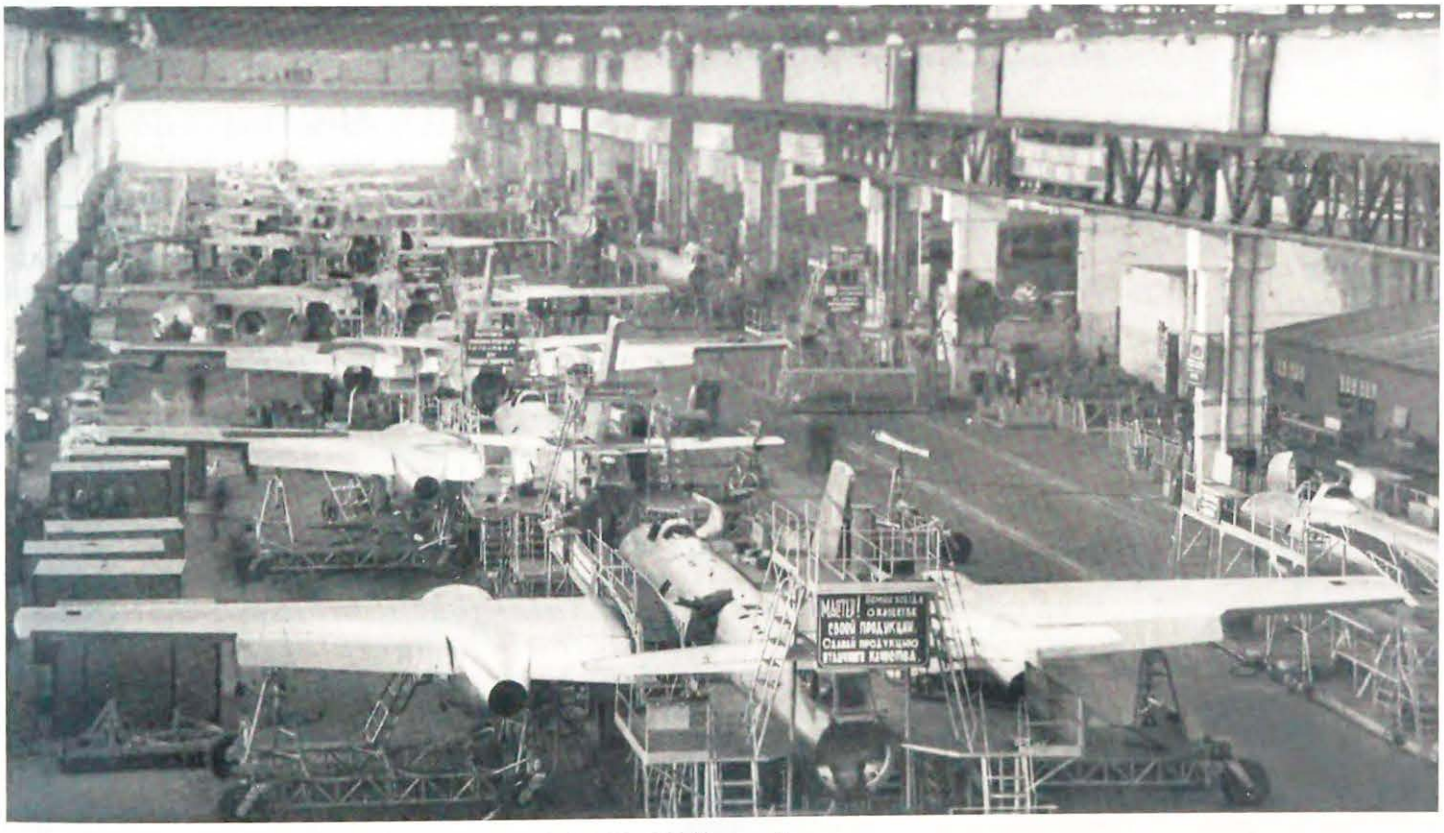
CHAPTER THREE

In production

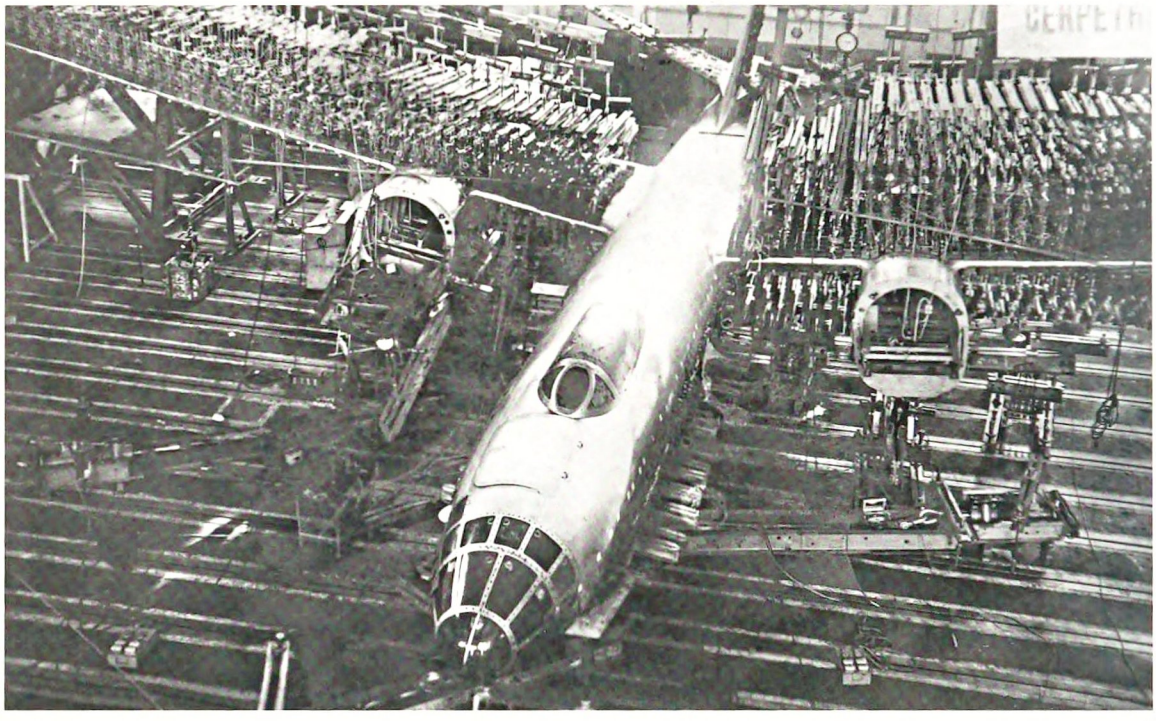
As mentioned in the preceding chapter, the IL-28 was first recommended for production as early as April 1948 after the first round of the state acceptance trials (with the original RD-45F engines). This recommendation was repeated on 16th September 1949, when the definitive version with VK-1 engines had passed its state acceptance trials.

A peculiarity of the Soviet aircraft industry was that the design bureaux had no aircraft factories of their own, save for the prototype manufacturing facilities – which could build anything, but only in a handful of copies, being unsuited for mass production. The major aircraft factories were all controlled by MAP and built whatever the ministry told them to. On the other hand, most of the production aircraft factories historically had strong ties with this or that OKB and built predominantly aircraft of the same make. This was because different aircraft from the same OKB usually had considerable technological commonality, meaning no complete change of the manufacturing process was required when a new type entered production.

In September 1949 three major MAP aircraft factories – MMZ No.30 '***Zna****mya tru****da***' (*Mos****kov****skiy ma****shin****ostro****it****el'nyy za****vod*** – Moscow Machinery Plant 'Banner of Labour') in the centre of Moscow, plant No.64 in Voronezh (central European Russia) and plant No.166 in Omsk (Western Siberia) – started tooling up to build the IL-28. Actual production at all three factories began in 1950. MMZ No.30, which was located at Moscow-Khodynka right across the airfield from the Ilyushin OKB, was assigned as the leading manufacturer of the type, assisting the other plants in launching production. The choice of the leading manufacturer was not a matter of chance. The plant already had some



Production IL-28 bombers in the final assembly shop of plant No.64 in Voronezh.



A Voronezh-built IL-28 undergoes check-up static tests to make sure it conforms to the specifications.

experience with Ilyushin designs, having produced the IL-2 attack aircraft during the war; also, the close proximity of the design bureau allowed problems arising during production entry to be rapidly resolved.

At the beginning of IL-28 production MMZ No.30 – later called MAPO (*Mos**kov**skoye aviatsi**on**noye proiz**vod**stvennoye obyedi**nen**iye* – Moscow Aircraft Production Association) – was considerably enlarged, absorbing the co-located aircraft factory No.381 in 1950. Khodynka had a 1,800-m (5,910-ft) paved runway, but flying the brand-new bombers from there was impossible – for security reasons if nothing else. Therefore, in parallel with the preparations for IL-28 production a new flight test facility was built at Tret'yakovo near the town of Lookhovitsy in the south-east of the Moscow Region; the dismantled bombers were delivered there by road and rail.

The Voronezh aircraft factory – now called VASO (*Vo**ron**ezhskoye aktsio**ner**noye samo**lyo**tostroi**it**el'noye **ob**shchestvo* – Voronezh Aircraft Production Joint-Stock Co.) – was then building the IL-10 *Beast* piston-engined attack aircraft. The Omsk aircraft factory – now called OAPO Polyot (*Om**skoye aviatsi**on**noye proiz**vod**-stvennoye obyedi**nen**iye* – 'Flight' Omsk Aviation Production Association) – had previously produced Tu-2 bombers (up to 1945) and Yakovlev Yak-9 piston-engined fighters. Thus the IL-28 was the first turbine-engined type for both plants (afterwards, plant No.64 would produce both jets and turboprops).

Meanwhile, the 'rivalry' between the IL-28 and the Tu-14 (and the argument between the two types' supporters in the MoD) continued. At the end of 1949 Lt.-Gen. Oleg V. Tolstikov was superseded as GK NII VVS chief by Maj.-Gen. Mikhail V. Red'kin, who apparently favoured the IL-28. In 1950, when the Tu-14 passed another round of its state acceptance trials, the GK NII VVS trials report read: *'Considering that currently there is no [operational] state-of-the-art fast bomber capable of carrying torpedoes and naval mines, the Tu-14 [...] is recommended for production, but solely for equipping the Naval Aviation. [...] Due to its long take-off run and take-off distance [...], as well as its insufficient speed performance [...], the Tu-14 cannot be recommended for Air Force use as a tactical bomber.'* Hence the Tu-14 was produced only on a small scale at aircraft factory No.39 in Irkutsk (Eastern Siberia).

After the type's first public appearance at the 1950 May Day parade in Moscow the NATO's Air Standards Co-ordinating Committee (ASCC) initially allocated the reporting name *Butcher* to the IL-28. However, this was quickly changed to *Beagle* to avoid confusion with the Tupolev Tu-16 medium bomber which was codenamed *Badger*.

Production picked up speed rapidly. Of course, the basic bomber with no suffix letter to the designation was the first to enter production; at most of the factories it had the in-house product code *'iz**del**iye* 5'; *izdeliye* (product) such-and-such is a code for Soviet/Russian military hardware items commonly used in paperwork to confuse outsiders. The Mikoyan MiG-23 tactical fighter had an interim version between the initial MiG-23S *Flogger-A* and the MiG-23M *Flogger-B* that had no suffix letter to the designation for some reason; it was popularly known as ***dva**dtsat' **tre**tiy 'bez **book**vy'* ('twenty-third' with no [suffix] letter, or *sans suffixe*), and by analogy the bomber version is hereinafter called

IL-28 *sans suffixe*. MMZ No.30 produced three versions at once – the bomber, the IL-28U trainer and the IL-28R reconnaissance aircraft (see Chapter 4), while the other two concentrated on the bomber.

By 1953, however, the output of the three factories could no longer meet the growing demand, especially because the IL-28 was now being exported. Therefore, in 1953 a further four (!) MAP aircraft factories started building the *Beagle* – with varying success. The first to do so was plant No.23 in Fili, then a western suburb of Moscow (now a residential area well within the city), which began preparations for production on 1st January. Again, this factory had a long history of building bombers, having manufactured the IL-4 and Tu-2 during the war; in the early 1950s it had built the Tu-4, ceasing production of the type in 1953. However, plant No.23 managed to complete only two IL-28s before it was transferred to Vladimir M. Myasishchev's new design bureau (accordingly known as OKB-23) by MAP order and tasked with building the brand-new Myasishchev M-4 *Bison-A* four-turbojet strategic bomber.

Two other factories were located in Kuibyshev (now renamed back to Samara), central Russia. Plant No.1 had considerable experience with jet aircraft by then, but all of them were fighters – the MiG-9, the MiG-15/MiG-15*bis* *Fagot-A/B* and UTI-MiG-15 *Midget* conversion trainer, and the MiG-17 *Fresco-A*; bombers were something outside its experience. Conversely, plant No.18 located right across the road was producing bombers at the time (specifically, the Tu-4) but had no prior experience with jets.

Plant No.1 completed its first pre-production IL-28 in August, using components supplied by the neighbouring plant No.18; in September the bomber successfully passed manufacturer's flight tests at Kuibyshev-Bezymyanka, the shared factory airfield of the two Kuibyshev plants, at the hands of factory test pilot Murzin. The aircraft met the specifications in full; moreover, its empty weight was reduced by 146 kg (321.8 lb) thanks to the deletion of the anti-flutter weights, the deletion of the parachute-retarded illumination flares (meant for use in forced landings at night) and their launch cassettes, and several other minor changes. These measures were also incorporated on the Moscow, Voronezh and Omsk production lines.

Again, both Kuibyshev factories were involved with the IL-28 only briefly, completing 50 bombers each before they were ordered to launch production of heavier stuff – the twin-turbojet Tu-16 medium bomber (plant No.1) and the four-turboprop Tu-95 *Bear* strategic bomber (plant No.18) – that same year.

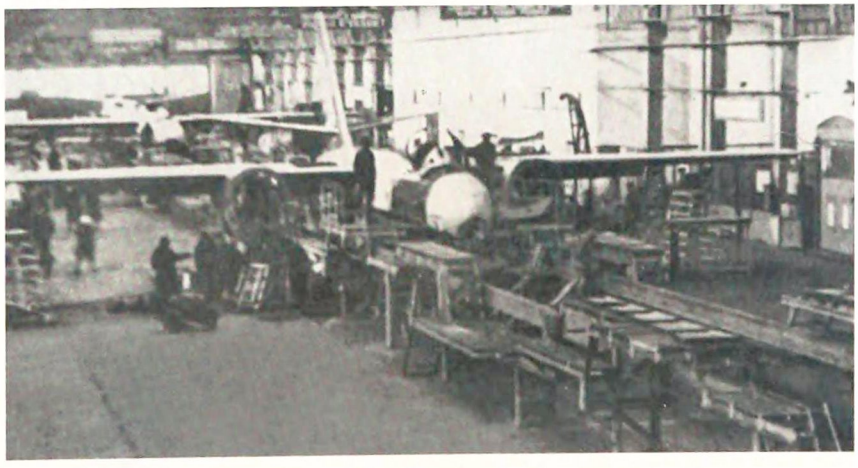
The fourth factory, No.39 in Irkutsk (which had just finished producing the Tu-14), differed from the rest in that the first and main version built there was the IL-28R. Production of the latter in Irkutsk began pursuant to Council of Ministers directive No.533-2090 dated 31st December 1952 and the corresponding MAP order No.6 dated 3rd January 1953. The schedule was rather tight – the plant was to launch production within seven months (by July); by comparison, in the case of the Tu-14 the time limit had been 10-12 months.

Production entry was accomplished within a very short time because all necessary manufacturing documents were on hand; much of the documentation was transferred from MMZ No.30, together with copies of templates and a shipset of parts for use as a pattern. However, success depended mostly on whether the assembly jigs and tooling could be manufactured within the tight time limits. To cope with this task, all of the plant's departments were called on for help; some of the existing jigs also came in handy. As a result, plant No.39 managed to tool up for IL-28R production in half the time it had required to tool up for the Tu-14, even though the scope of work was comparable.

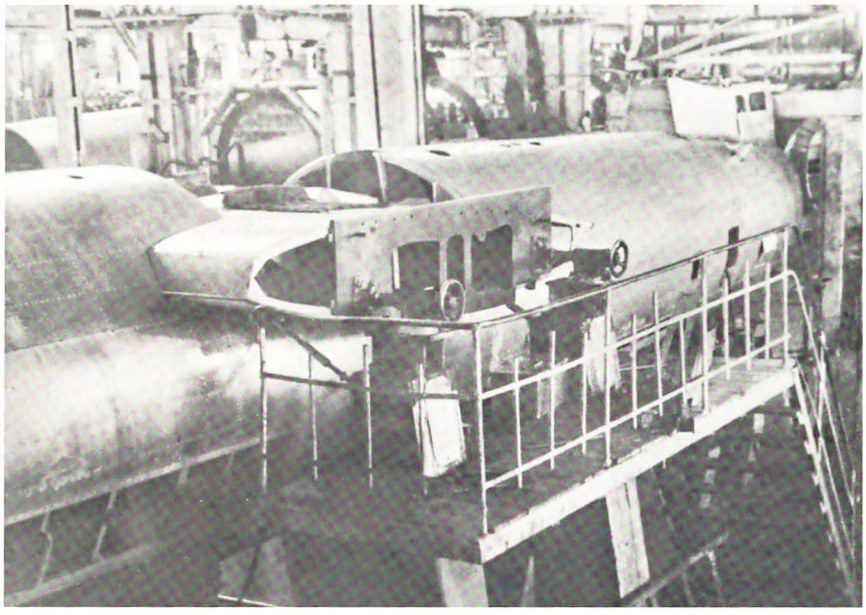
The first Irkutsk-built IL-28Rs were completed in the late summer of 1953. The aircraft still had its share of bugs, and a team of specialists from the OKB, including General Designer Sergey V. Ilyushin himself, came to the plant to provide help. This was no vain precaution because the IL-28's production techniques were new to plant No.39. The output increased steadily; at the same time the plant continued improving the production techniques, and by 1954 the type's manufacturing labour intensity had been reduced by 38.8%.

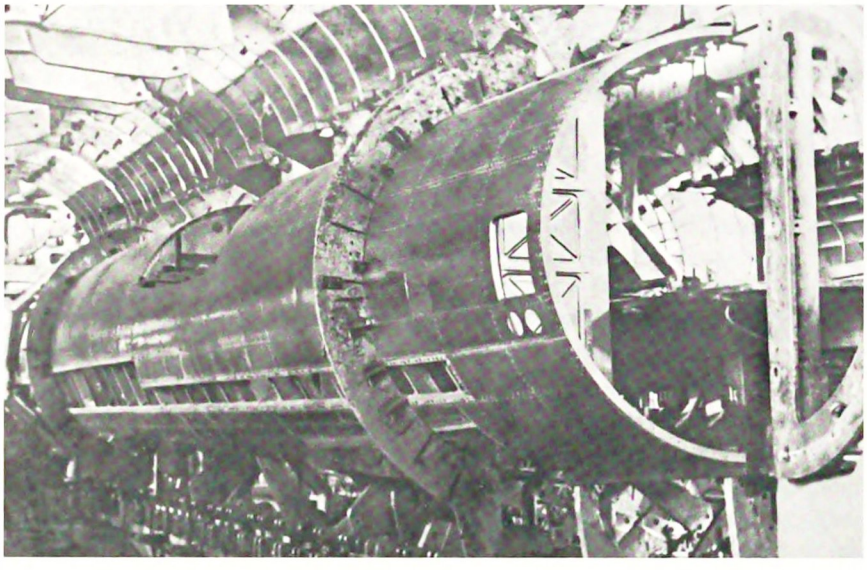
In 1955 plant No.39 manufactured 80 shipsets of target-towing equipment for the IL-28R allowing conversion to IL-28RBN standard (see Chapter 4).

Not until 1956 – the year that IL-28 production finally ended – did the Irkutsk plant switch to the bomber version (which required certain changes in the tooling), in keeping with Council of Ministers directives No.1920-1020 dated 16th October 1955 and GKAT order No.7424 dated 18th October 1955. (Note: GKAT = *Gosu**dar**stvennyy komi**tet** po aviatsi**on**noy **tekh**nike* – State Committee for Aviation Hardware, the name by which the former Ministry of Aircraft Industry was



IL-28s on the assembly line at plant No.166 in Omsk. The glazing is papered over to prevent scratches.





known in 1957-65 during the Khrushchov era. Later, MAP reverted to its previous name and 'rank'.) Only 135 bombers were built in the third and fourth quarters of the year, all of them for export. To distinguish them from the reconnaissance version these aircraft were unofficially designated IL-28B (*bombardi**rov**shchik* – bomber) in Irkutsk. The *Beagles* were test flown by factory test pilots S. I. Petrov, Vitaliy V. Yeliferov, I. V. Kuznetsov, P. I. Oovarov, Vladimir I. Semenchenko, Ghennadiy I. Starostenko, A. M. Yaroshevich and V. P. Naoorov.

Each of the seven factories had its own construction number system – or systems, as these were changed from time to time for security reasons. MMZ No.30 used three consecutive systems with a common production batch numeration. A peculiarity of Moscow production was that different versions were often intermingled within a batch, especially as the batches grew bigger over time.

System 1 was in use for batches 01 through 20, utilising straightforward eight-digit c/ns. For example, c/n 50300702 is deciphered as follows: year of manufacture 1950, MMZ No.30, Batch 07, 02nd aircraft in the batch. The earliest batches probably consisted of five aircraft each but this was later increased to ten or 20. The last known c/n under this system is 50302001.

System 2 was introduced in January 1951 right in the middle of Batch 20, switching to a nine-digit format and introducing the product code; the reason for this change was the IL-28R's production entry. The earliest known example is c/n 530512007, which means *izdeliye* 5 (IL-28 *sans suffixe*), MMZ No.30, year of manufacture 1951, Batch 20, 07th aircraft in the batch; by then there were at least 20 aircraft per batch. By comparison, c/n 430512301 has a 4 as the first digit to denote *izdeliye* 4 (IL-28R). The system remained in use up to and including Batch 32; the last known example is IL-28 *sans suffixe* c/n 530513201... but see next paragraph! (Note: One Batch 30 bomber has been reported as c/n 530523018, suggesting it was manufactured late and released by the factory in 1952.)

System 3 introduced in 1952 (from Batch 32) reverted to an eight-digit format but was structured somewhat differently. The earliest known example is IL-28 *sans suffixe* c/n 52003201 – that is, 5 for *izdeliye* 5, 2 for year of manufacture 1952, 0 for MMZ No.30 (the first digit is omitted for security reasons to confuse hypothetical spies, which was common practice at the

Top left: The fuselage of an Omsk-built IL-28 being mated with the wing centre section.

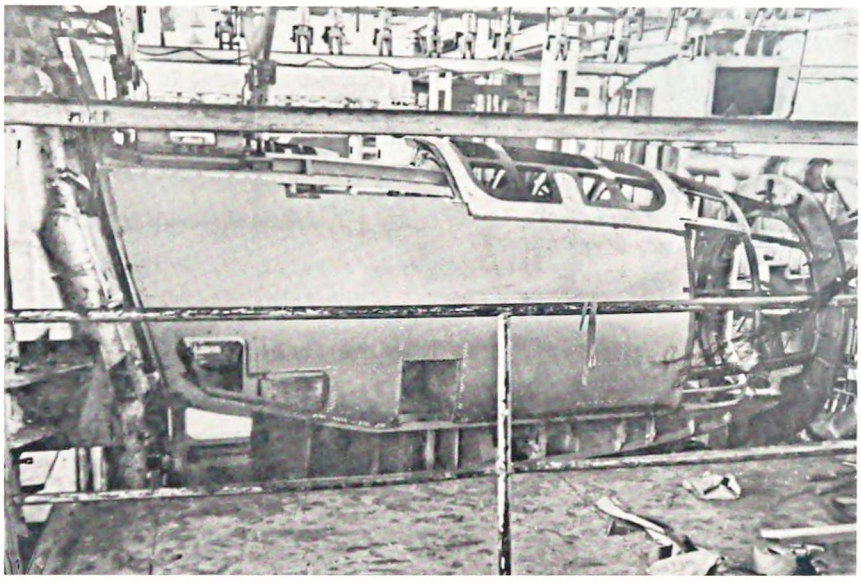
Above left: The centre fuselage in the assembly jig at Omsk, looking forward. Note the wiring access panels and the oblique camera port on the port side.

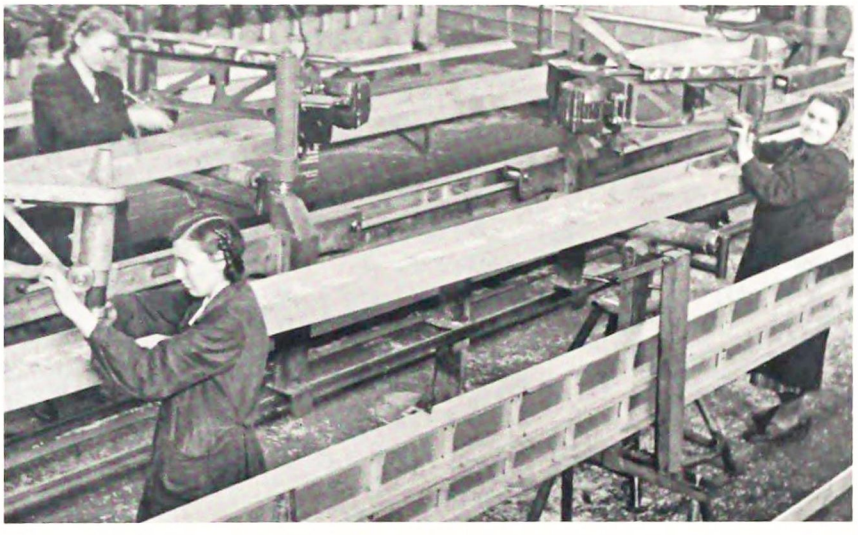
Left: The horizontal tail assembly jig at plant No.166.

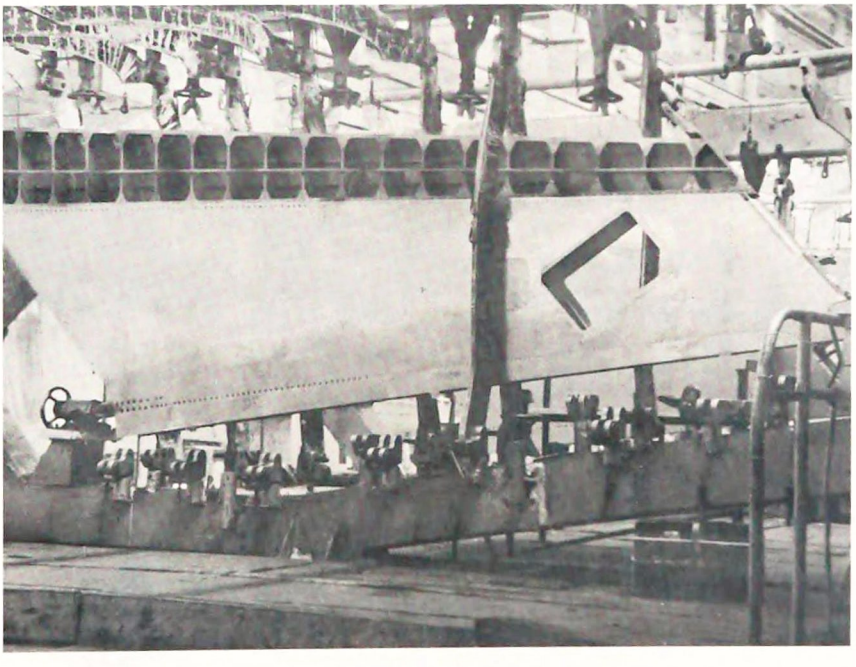
time), Batch 032, 01st aircraft in the batch. (Here, however, we have an interesting controversy: this very aircraft is also mentioned in the same document – an IL-28 structural manual featuring a list of detail changes in the course of production – under the old system as c/n 530513201, with 1951 as the year of manufacture! Perhaps the aircraft had been completed late and retroactively renumbered under the new system?) Compare this to c/n 42004303, an IL-28R (*izdeliye* 4) built in 1952. Thus, under System 3, which remained in use until the end of production, provision was made for building 100 or more batches; the number of aircraft per batch could be as many as 80 or maybe more – for example, IL-28 *sans suffixe* c/n 54005980. The highest known c/n under this final system is 65010809 – a Batch 108 IL-28U (*izdeliye* 6) built in 1955.

On Moscow-built IL-28s the c/n was normally stencilled on the starboard side of the nose and under the starboard stabiliser. Export aircraft were sometimes reported with System 3 c/ns inexplicably featuring a 5 instead of a zero after the factory designator (for example, 55056434) or had abbreviated c/ns with the year and factory number omitted – for example, IL-28 c/n 57019 (Batch 70) or IL-28U c/n 610007 (Batch 100). Such abbreviated c/ns were also stencilled on the inside of access hatches.

The Voronezh factory used two systems, also with a common batch numeration; interestingly, the first batch was Batch 00 – a pre-production batch with at least four aircraft. **System 1** was in use up to and including Batch 10, utilising seven-digit c/ns. For example, c/n 6450809 means plant No.64, *izdeliye* 5, Batch 08, 09th aircraft in the batch (probably with ten aircraft per batch). In 1952 it was superseded by **System 2** which had a different seven-digit format – for example, c/n 2401104, which means year of manufacture 1952, plant No.64 (the first digit is omitted), Batch 011, 04th aircraft in the batch (with mostly 20 aircraft per batch, later increased to 50 not later than Batch 041). It seems that for a while there was some inconsistency in construction number allocation – the last confirmed c/n under the old system is 6451001, but an older (Batch 9) aircraft has been reported under the new system as c/n 2400908! (This may well be true – such things are known to have occurred at other Soviet aircraft factories.) The new system continued in use until the end; the highest known c/n is 5406005 – which, incidentally, suggests that the aircraft (as well as other



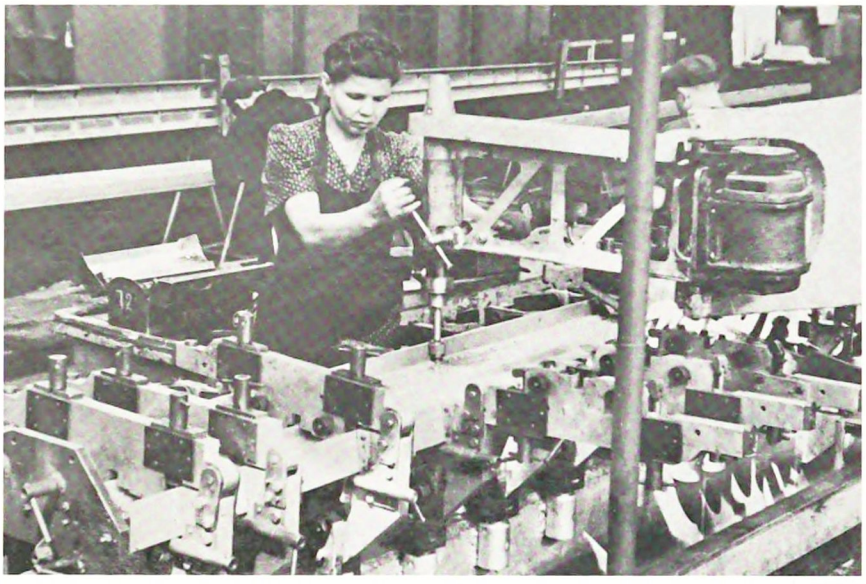


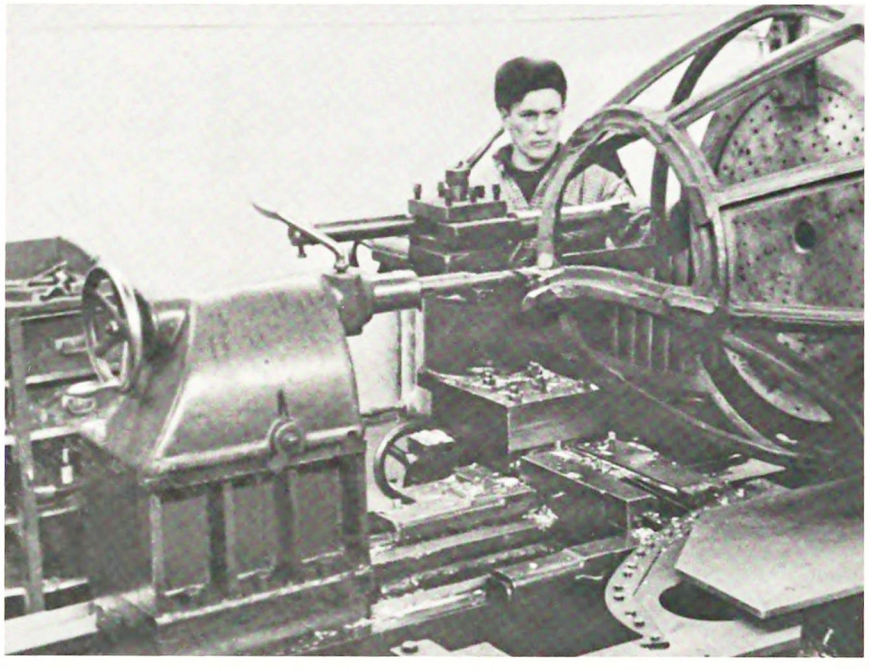


Top right: The forward fuselage (section F1) build-up area at the Omsk plant.

Above right: The wing build-up area at the same plant. Women made up much of the workforce.

Right: An IL-28 fin at the Omsk plant, showing the cut-out at the top for a slot antenna.





IL-28s in batches 058 and 059) was built in 1955, albeit IL-28 production in Voronezh officially ended in 1954!

Voronezh-built IL-28s had the c/n stencilled on the fin or under the starboard stabiliser. As an aside, the second c/n system was 'inherited' by the types produced by plant No.64 after the IL-28 – the Tu-16, the Antonov An-10 *Cat* four-turboprop medium-haul airliner and the closely related An-12 *Cub* medium transport.

The Omsk factory likewise used two systems, also with a common batch numeration. **System 1** was 'inherited' from the earlier types built in Omsk; the first machine was c/n 0016601 – that is, Batch 00, plant No.166, 01st aircraft in the batch – and the pre-production batch was quite large, consisting of at least 12 aircraft. The system remained in use until Batch 14; the last known example is c/n 1416601. **System 2** was introduced in 1952 from Batch 15 onwards, featuring an eight-digit format but being basically similar to the second Voronezh system; thus, c/n 26601501 means year of manufacture 1952, plant No.166 (the first digit is omitted), Batch 015, 01st aircraft in the batch. Individual batches consisted of up to 40 aircraft; the highest known c/n is 56606702, a bomber built in 1955. Again, some exported Omsk-built bombers reportedly had modified c/ns with a 5 instead of a zero after the factory designator (for example, 56652509). The c/n was sometimes stencilled under the horizontal tail.

The Kuibyshev plant No.1 used the same seven-digit c/n system it had used previously for the MiG-17 *sans suffixe*. Again, there was a pre-production batch, the first aircraft in it being c/n 1500001 – that is, plant No.1, *izdeliye* 5, Batch 00, 001st aircraft in the batch. The three-digit presentation of the aircraft's number in the batch is not so unusual if one remembers that this was also the case with Kuibyshev-built jet fighters – and some batches of Kuibyshev-built MiG-15s and MiG-17s indeed consisted of more than 100 aircraft. The highest known c/n was 1501017; considering that only 50 were built by this factory, there were two or three batches at the most.

The other Kuibyshev plant, No.18, also had a seven-digit c/n system but this was structured differently. For example, c/n 3800109 – that is, year of manufacture 1953, plant No.18 (the first digit is omitted), Batch 001, 09th aircraft in the batch.

Beagles manufactured by the Irkutsk factory normally had seven-digit c/ns. Thus, c/n 3900101 means 3 for year of manufacture 1953, 9 for plant No.39 (the first digit is omitted), Batch 001, 01st aircraft in the batch; usually there were 20 aircraft per batch. Batches 01 through 19 were IL-28Rs (the last example built was c/n 6901920); batches 20 through 26 were bombers (known locally as IL-28Bs). Again, Irkutsk-built export aircraft usually had abbreviated five-digit c/ns featuring a product code and the batch number in a two-digit format; for example, IL-28R c/n 41918 delivered to

Czechoslovakia (that is, *izdeliye* 4, Batch 19, 18th aircraft in the batch) and IL-28B c/n 52109 delivered to Poland (*izdeliye* 5, Batch 21, 09th aircraft in the batch). Unfortunately no IL-28s built by the Moscow plant No.23 have been identified yet.

As soon as the IL-28 entered production the Ilyushin OKB started improving the design, and a whole raft of detail changes was introduced in the first year of production (1950). In spite of the state commission's findings, the first six batches of the bomber built by MMZ No.30 still lacked a de-icing system; not until Batch 07 were the appropriate air ducts and valves installed in the engine nacelles, supplying hot air to the wing, tail unit and air intake leading edge de-icers. The system was semi-automatic; the pilot needed to switch on the port and starboard halves separately and keep an eye on the temperature gauges in order to avoid local overheating of the airframe structure.

Moscow-built Batch 11 introduced a blind flying hood for the pilot; this consisted of two parts – one for the windshield and one for the movable portion. Shortly afterwards the double glazing of the canopy was replaced by single glazing made of thicker Plexiglas. Batch 13 built in October 1950 introduced a blind flying hood for the navigator/bomb-aimer as well, enabling simulated IMC training. Concurrently, in response to crew complaints of excessive cabin temperature at low altitude, the pressure cabin ventilation system was modified to feature ram air intakes; these were sealed off at high altitude when the cabins were pressurised. On Batch 14 the circular direct vision window in the cockpit (meant to prevent the canopy from misting up on take-off) was moved from the hinged portion to the port sidelight of the windshield and made smaller.

The tactical bomber aviation was re-equipping with jets *en masse*, and the military demanded more and more; IL-28 production grew steadily, but so did the production plans handed down by the government. A Council of Ministers directive issued in October 1950 increased MAP's production target for 1951 from the originally envisaged 450 *Beagles* to 530. Of these, 400 aircraft (220 IL-28s *sans suffixe*, 80 IL-28Rs and 100 IL-28Us) were to be manufactured by the Moscow plant; the Voronezh and Omsk factories were to contribute 75

Vitaliy V. Yeliferov, a factory test pilot of plant No.39 in Irkutsk who check-flew many IL-28s.

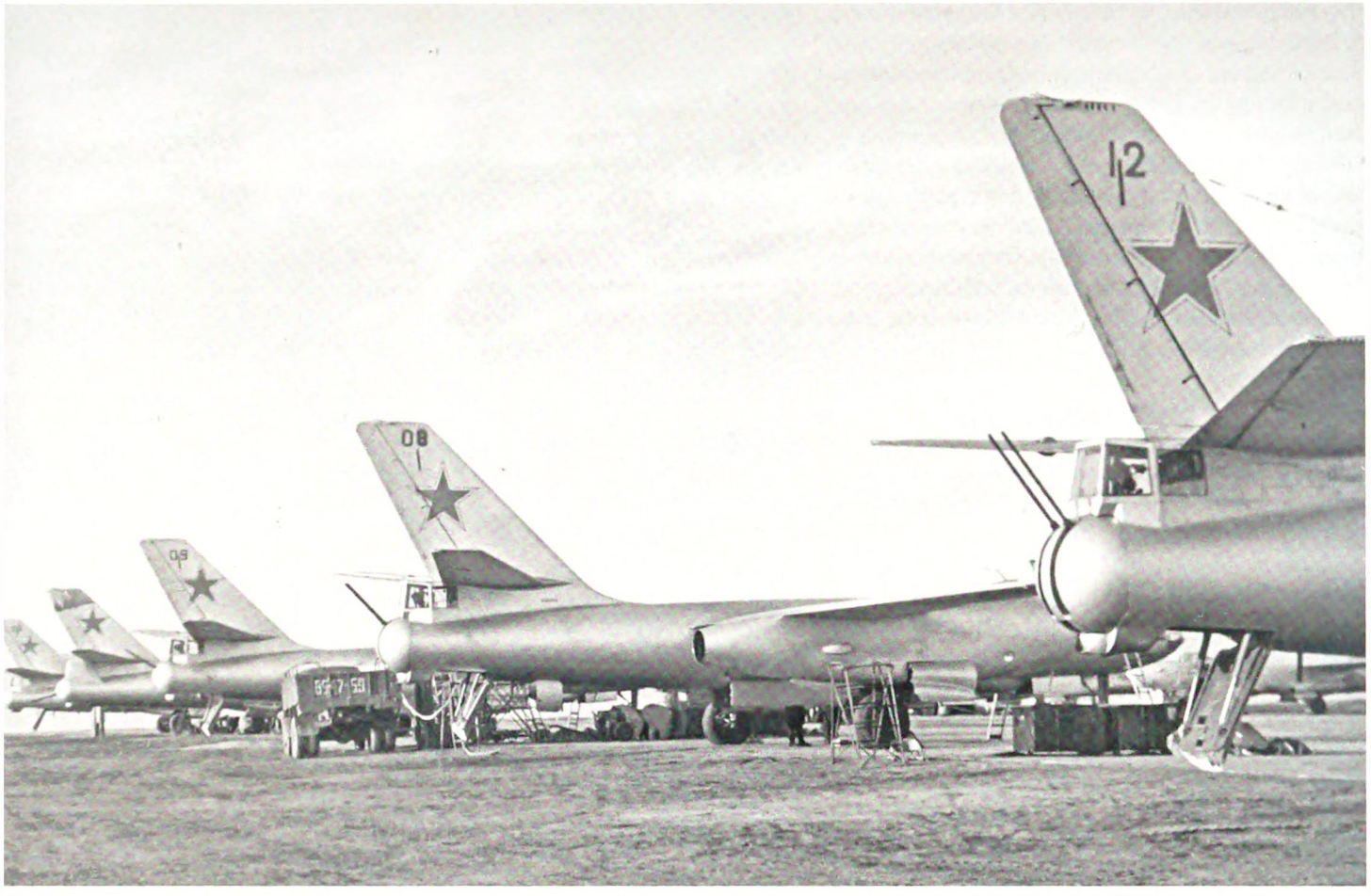
Opposite page, top: Another scene from the Omsk plant, and another 'Russian edition of Rosie the Riveter'; this one is actually using a drilling machine.

Opposite page, centre: A worker puts the finishing touches to the cast magnesium frame of the navigator's station before it goes to final assembly.

Opposite page, bottom: This worker is using an automated riveting tool on an IL-28 wing panel.

Left: A brand-new IL-28 built by one of the two Kuibyshev plants.

This Voronezh-built IL-28 (c/n 2401403) crash-landed at Voronezh-Pridacha (the factory airfield of plant No.64) after a pre-delivery test flight on 11th May 1952, piloted by M. M. Zinchenko. The extensive damage to the landing gear and forward fuselage is evident.



Production IL-28s on the flight line of a Soviet bomber unit, including a Voronezh-built example nearest to camera and an APA-2 GPU hooked up to the second aircraft. The gunner's entry hatches are clearly visible; the gunner's station of the fourth aircraft is under wraps.

and 55 bombers respectively (in 1950 they had manufactured only pre-production batches).

In theory, the IL-28s manufactured by the three plants should conform to a common standard, but this was not always the case – even as regards structural design. Most notably, the Voronezh-built bombers lacked the production break between fuselage frames 38A/38B, their fuselages being manufactured in three sections instead of four – the two unpressurised sections of the Moscow-built and Omsk-built *Beagles* were combined into a single whole. Also, some of the refinements which were introduced in the course of production on Moscow-built IL-28s were present from the outset on Omsk-built and Voronezh-built examples.

At the insistence of the military a number of new access panels were added to facilitate maintenance. A number of important changes were introduced on IL-28 *sans suffixe* c/n 50301801, which was built in late 1950 and modified to become the *etalon* (standard-setter, or pattern aircraft) for 1951 production. (Curiously, the c/n 50301801 is found in the abovementioned structural manual; yet an Ilyushin OKB test report dated May 1951 gives the aircraft's c/n as 51301801!) In particular, the original IL-K6 tail turret gave place to the IL-K6M version (*modifitseerovannaya* – modified) which was 50 kg (110 lb) lighter, weighing 375 kg (826 lb) without cannons and ammunition, and had a revised AC power supply system; in production form it was designated IL-K6-51 to denote the year of introduction. The rear fuselage structure was lightened as well, the fuel tanks in the fuselage were fitted with shut-off valves preventing total fuel loss if one of the tanks was punctured by enemy fire, the triplex windscreens of the cockpit and the navigator's station were provided with electric de-icers, measures were taken to protect the engine control cable runs against icing etc. From Batch 18 onwards Moscow-built IL-28s were powered by modified VK-1 engines featuring anti-surge bleed valves which were opened for a couple of minutes in the event of pressure fluctuations; previously IL-28 pilots had been forced to switch on the de-icing system in the event of surge, since it used engine bleed air.

Shortly afterwards the emergency wheel braking system was revised to feature separate air supply for the port and starboard mainwheels; concurrently the hydraulic lines' cross-section was increased, reducing the landing gear retraction/extension time. Responding to numerous complaints from the Air Force about the unsatisfactory operation of the nose gear unit's spring-loaded telescopic emergency extension actuator, the OKB did some investigating and found that the mechanism was getting clogged with dirt or snow

during operations from unpaved runways. As a temporary remedy, the actuator was initially provided with a tubular shield; a beefed-up version was developed later. A brake parachute installation was tested on IL-28 *sans suffixe* c/n 530512007 in early 1951 with satisfactory results.

The Ministry of Electronics Industry's plant No.339, which manufactured the PSBN-M radar, could not keep up with the IL-28's production rate and was unable to supply enough radars for all the bombers. Hence some of the IL-28s left the factories with no radar, although the radome and the internal fittings were still there (with the prospect of retrofitting the radar later on); four ballast weights with a total weight of 115 kg (253 lb) were installed at the navigator's station to maintain the correct CG position. Such downgraded bombers were equipped with an OPB-5S optical bomb sight (S = *sin**khron**nyy* – synchronised) instead of the standard OPB-6SR.

In recognition of their efforts to create a modern jet tactical bomber, on 12th March 1951 General Designer Sergey V. Ilyushin and several other OKB-240 employees involved in the development of the IL-28 – M. F. Astakhov, Valeriy A. Borog, Viktor N. Boogaiskiy, N. F. Zotov, A. Ya. Levin, G. M. Litvinovich, M. I. Nikitin, B. V. Pavlovskiy, K. V. Rogov, Ye. I. Sankov and V. A. Fyodorov – were awarded the prestigious Stalin Prize (2nd Class) *'for outstanding inventions and improvements in the field of machinery design'*. In later years, after Stalin's death and the denouncement of Stalinism, this award became known as the State Prize.

In May-June 1952 several production IL-28 bombers built in Moscow, Voronezh and Omsk underwent check-up tests at GK NII VVS to see if they conformed to the specifications and how much they differed from each other. Such tests were (and still are) common practice. It was established that, although not 100% identical, the aircraft of all three factories met the Air Force's specifications almost fully. None of the bombers was more than 48 kg (105.8 lb) overweight; the Omsk-built aircraft was not only the lightest but also the 'longest-legged', exceeding the stipulated range target by 40 km (24.85 miles).

The table on this page shows how the IL-28s built by different plants complied with the specifications. All the bombers are 1952 production, except the machine built by plant No.1, which was built in 1953.

More changes were introduced in 1952. Among other things, the gunner's entry hatch was made longer; the forward fuselage skin was thickened a little to stiffen it, preventing deformations at high speeds which spoiled the bomber's aerodynamics. The KP-14 stationary breathing apparatus used hitherto were replaced by the KP-18 model, and various aerials were repeatedly repositioned to improve the avionics' operation. One of the most important changes was the installation of improved VK-1A engines on production bombers; these had the same 2,700-kgp (5,950-lbst) rating as the VK-1 but their service life was increased to 150 hours and, from Batch 6 onwards, to 200 hours – twice that of the original model.

As mentioned earlier, in 1953 plants Nos. 23, 18, 1 and 39 (in that order) started manufacturing the IL-28. As compared to 1950 when the IL-28 entered production, the output for 1953 was increased almost tenfold – 1,608 aircraft versus 164! Production peaked in 1954 when plants Nos. 30, 39, 64 and 166 manufactured 1,768 IL-28 in various versions.

Comparative performance of IL-28 bombers built by different plants (check-up tests at GK NII VVS)

	Specifications	Plant No.30	Plant No.64	Plant No.166	Plant No.1 *
Empty weight, kg (lb)	12,890 (28,420)	12,796 (28,209)	12,938 (28,523)	12,795 (28,207)	12,744 (28,095)
Take-off weight, kg (lb):					
normal	18,400 (40,560)	18,400 (40,560)	18,400 (40,560)	18,400 (40,560)	18,400 (40,560)
maximum	–	21,200 (46,740)	21,069 (46,448)	21,200 (46,740)	21,084 (46,481)
Fuel load, kg (lb)	7,908 (17,434)	7,880 (17,372)	7,870 (17,350)	7,895 (17,405)	7,867 (17,343)
Maximum speed, km/h (mph): †					
at sea level	–	800 (496)	800 (496)	800 (496)	800 (496)
at 4,500 m (14,760 ft)	900 (559)	894 (555)	894 (555)	894 (555)	899 (558)
Climb time, minutes:					
to 5,000 m (16,400 ft)	7	6.5	6.5	6.5	6.2
to 10,000 m (32,810 ft)	18	19	19	19	17.5
to service ceiling	37	39	39	39	37.6
Service ceiling, m (ft)	12,300 (40,350)	12,300 (40,350)	12,300 (40,350)	12,300 (40,350)	12,300 (40,350)
Effective range, km (miles) ‡	–	2,500 (1,552)	2,500 (1,552)	2,515 (1,562)	2,540 (1,577)

Notes:

* First pre-production aircraft (c/n 1500001) built in 1953

† At full military power/normal take-off weight

‡ With a 1,000-kg (2,205-lb) bomb load at maximum possible altitudes of 10,000-12,000 m (32,810-39-370 ft)

Opposite page: '03 Red', a rather weathered IL-28 from a late Moscow-built production batch built in 1955 (c/n 55006968). Note that production IL-28s had the landing lights located further forward (on the second cowling sections) and the pitot located the starboard wingtip instead of at half-span; compare this to the photos of the prototype on page 33.

A further refined version of the tail turret, the IL-K6-53, was introduced on the production lines in 1954; it was further lightened, weighing 346 kg (762 lb) without cannons and ammunition, and had a new AKP-5 swivelling pump unit. IL-28s built from 1954 onwards left the factories with the gun cameras already fitted (not just supplied with the aircraft). Other changes made that year included measures improving reliability and ease of maintenance, as well as DV-3 rubber-bladed cooling fans at the crew workstations and an extra step on the gunner's hatch to facilitate entry/egress.

In addition to the design changes proper, it deserves mention that even paints and coatings changed over time. Early-production IL-28s, like the other Soviet civil and military aircraft of the time, received a protective coat of PF-170 pentaphthalic varnish over natural metal (PF = *penta**ft**alevyy* [*lak*]), and the quantity per aircraft varied from 73 to 108 kg (from 161 to 238 lb), depending on the factory and the production batch. However, the PF-170 was insufficiently durable, adhering poorly to the electrochemically coated duralumin skin, and soon the varnish started flaking and peeling. Also, pentaphthalic varnish required lengthy hot drying to cure, which made it unsuitable for in-service repairs (if left to cure at ambient temperatures, the result was substandard). The Air Force command found this situation insupportable, and the All-Union Institute of Aviation Materials (VIAM – *Vseso**yooz**nyy insti**toot** aviatsi**on**nykh materi**ah**lov*) developed a new grade 9-32 butyl methacrylate varnish. This had much better adhesion and could dry at normal temperatures, producing a strong, waterproof, fuel-proof and light-resistant coat. Adding aluminium powder to the varnish produced grade 9-32Al paint which soon became the standard finish for new-build IL-28s.

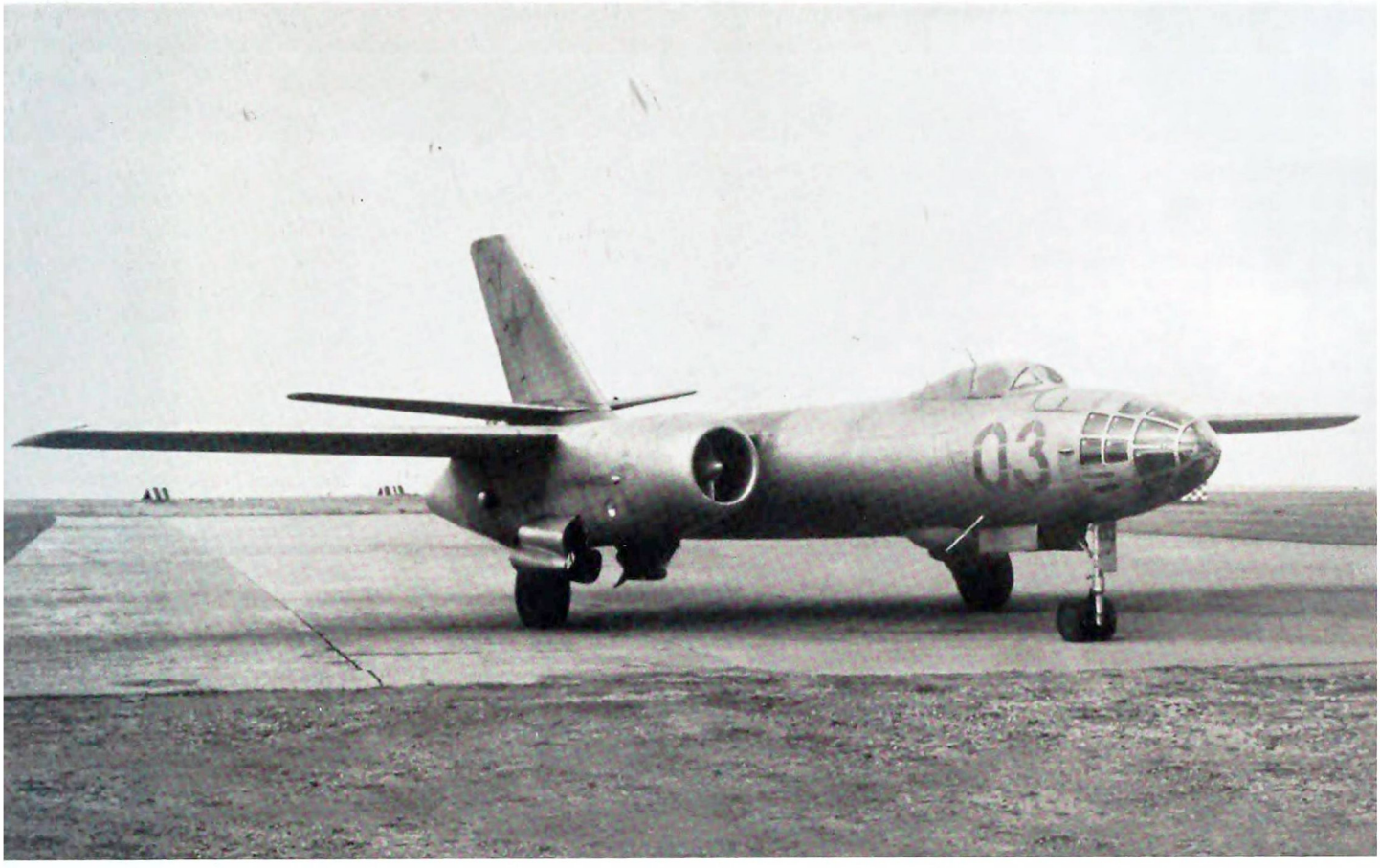
Believe it or not, the *Beagle* was actually cheaper than the single-engined MiG-15 and MiG-17 fighters, despite being much larger and having two engines. The reason was the lower manufacturing costs thanks to the simple and well thought-out design that lent itself well to mass production, making the IL-28 easy to build (the production rate at MMZ No.30 could be as high as 100 aircraft per month). Few problems were encountered during pre-delivery flight tests; these were mostly equipment failures (primarily those of the autopilot and the radar), but there were also cases of asymmetric flap deployment due to vapour locks in the hydraulic lines. One by one these bugs were ironed out, and the deliveries went ahead at a steady pace, allowing Soviet Air Force and Soviet Navy bomber units to transition from the Tu-2 to the IL-28 rapidly.

The upper table on page 46 shows some of the changes introduced on the Moscow (MMZ No.30), Voronezh and Omsk production lines. Unfortunately no such information is available for the Kuibyshev and Irkutsk factories.

Yet, the clouds were already beginning to gather over the *Beagle*. Such was the pace of aviation hardware development in those days that in a matter of five years an initially promising aircraft could be overtaken by technology and the Powers That Be could do a dramatic about-face in their assessment of it. In August 1955 the Presidium of the CPSU (Communist Party of the Soviet Union) Central Committee – the nation's top policy-making organ – instructed Minister of Defence Marshal Gheorgiy K. Zhookov and Soviet Air Force Commander-in-Chief Air Marshal Pavel F. Zhigarev to *'consider the expediency of further production of the IL-28'* and some other aircraft. The implication behind this phraseology was unmistakable – it was a 'kiss of death'. The reason was simple – the NATO, first and foremost the USA, was already fielding supersonic interceptors and cruise missiles that made the IL-28 seem outdated. The General Staff chimed in, too; writing to Zhigarev, Chief of General Staff Marshal Vasiliy D. Sokolovskiy quoted the performance figures of the new Lockheed F-104A Starfighter and the Convair F-102A Delta Dagger to prove his point that the Soviet Union had fallen behind the 'potential adversary' in aircraft development.

That said, the Soviet Air Force command took the decision to curtail production of the 'outdated' bomber, reducing its final IL-28 order for 1955 by 250 aircraft. Therefore, on 3rd February 1956 the Council of Ministers issued a directive terminating production of the IL-28 at the end of the year; in 1956 the *Beagle* would be manufactured solely for export to 'friendly nations'. Pavel F. Zhigarev stated in one of his orders that *'the performance, particularly the speed, of the IL-28 aircraft no longer meets current requirements for a tactical bomber'*. He further wrote that MAP had been ordered to test and refine the Ilyushin IL-54 *Blowlamp*, Yakovlev Yak-26 *Flashlight-B* and Tupolev Tu-98 *Backfin* transonic/supersonic tactical bombers by the end of 1955, and that by then the tactical bomber aviation's first-line units would be up to 64% of their nominal strength (62 aircraft per bomber division), which would fill first-priority needs as regards readiness and training levels.

IL-28 production statistics are a bit controversial. Most sources, including the Ilyushin Aircraft Complex, state Soviet IL-28 production as 6,316 aircraft, detailing it by version and year as shown on page 46. However, some sources (supposedly also relying on archive data) quote a significantly lower overall production figure, albeit without a version-by-version breakdown – 6,217 aircraft! The discrepancies arise in the figures for 1952 (Moscow production for that year adds up to 501 instead of 601) and 1956 (a single Omsk-built IL-28 *sans suffixe* is reported, making the total 154 instead of 153). Thus, the total number of Moscow-built IL-28s adds up to 3,977 instead of 4,077 while the number of Omsk-built *Beagles* is one more (757 instead of 756). This explains the 99 aircraft unaccounted for.


03

03

Some modifications introduced in the course of IL-28 production

Modification	Incorporated from c/n ... onwards		
	Plant No.30	Plant No.64	Plant No.166
Round ventilation window moved from hinged canopy section to port windshield sidelight and reduced in diameter; glazing thickness reduced	50301408	6450001	0016601
Anti-flutter weights between wing ribs 28 and 32 deleted	53005005	3402701	36603509
VK-1 engines with anti-surge bleed valves installed	50301801	6450301	0416601
PNR-45 start-up fuel pumps installed on the engines	530512705	6450606	1016601
Additional fuel meter sensors in the front and rear groups of tanks	50302001	6450301	0516601
Emergency ground power disconnect circuit breaker added	50300801	6450101	0216601
Generator circuits with R25A voltage regulators, VS-25A resistors and T1-G stabilising transformers instead of R20R, VS-20A and T1-A respectively	530512802	6450701	1416601
Launch cassettes for PAR-8 parachute-retarded illumination flares and their controls deleted	53005430	3403001	36603801
KP-18 breathing apparatus fitted instead of KP-14	530512609	6450508	1216601
Three additional oxygen bottles installed	53005801	First quarter of 1954	36604201
SP-50 Materik ILS instead of OSP-48 ILS	50301201	6450101	0116601
Navigator able to use the RSU-5 (RSIU-3) command radio	50301901	6450101	0316601
RSIU-3M transmitter and receiver modules switched places for ease of tuning	52003601	2401509	26602201
F-14A static filters and screen cables introduced in tail turret to improve radio reception quality (reduce interference)	53005825	First half of 1954	First half of 1954
SRO IFF transponder instead of Magniy transponder	52004113 (1952)	First half of 1953	First half of 1953
Retaining fixtures added to prevent damage to OPB-6SR (or OPB-5S) bomb sight on take-off and landing	52003303*	2401201*	26602110*
ESBR-49M bomb release mechanism and KVSB-48A drop mode selector fitted instead of ESBR-45 and KVSB-48	54006102	4404141	46604611
Sway braces added to BD4 centreline rack to prevent rocking of FAB-3000M-46 bomb causing course deviations	54006201	4404311	46604815
Vertical camera triggered by bomb release mechanism for bomb damage assessment	50301705	6450001	0016601
Ground maintenance switches for bomb bay door control and bomb release circuit control moved from inside the bomb bay to the outside for the safety of the ground crews	50301101	6450002	0316601
IL-K6-51 tail turret installed	530512601	6450507	1416601
Check valves added in nose cannon charging air lines to prevent improper loading of rounds	50301901	6450201	0316603
Check valves added in nose cannon charging air lines to improve combat survivability	53005660	?	36604001
Nose cannon ammunition boxes reinforced	50301006*	?	0016601*
Routing of nose cannon ammunition belts changed to prevent jamming	50301301*	6450004*	0016601*
Routing of nose cannon ammunition belts changed to prevent jamming (again)	52004201*	2402001*	26602801*
PKI-1 gunsight mount revised to prevent off-boresighting	50301801	6450201	0316603

* Older aircraft were modified accordingly

Soviet IL-28 production by year

Version	Plant	1950	1951	1952	1953	1954	1955	1956	Total
IL-28	No.1	-	-	-	50	-	-	-	50
	No.18	-	-	-	50	-	-	-	50
	No.23	-	-	-	2	-	-	-	2
	No.30	142	224	391	618	500	615	-	2,490
	No.39	-	-	-	-	-	-	135	135
	No.64	4	75	170	370	303	-	-	922
	No.166	10	53	111	176	251	155	-	756
	Total	156	352	672	1,266	1,054	770	135	4,405
IL-28R	No.30	-	80	100	2	-	-	-	182
	No.39	-	-		30	114	162	18	324
	Total	-	80	782	32	114	162	153	506
IL-28U	No.30	8	104	110	310	600	273	-	1,405
Grand total		**164**	**536**	**882!**	**1,608**	**1,768**	**1,205**	**153!**	**6,316**

Note: The above figures signify the number of aircraft accepted by the MoD's quality control at the factories, *not* the number of aircraft actually built. For example, there are reports that the total number of IL-28s manufactured in 1950 was 235 but only the 164 indicated in the table were accepted by the military, the remaining 71 being deferred because of defects. The table does not include the IL-28T torpedo-bomber, which entered production at plant No.39 in 1955, and the IL-28PP ECM version, although there is evidence that it was built as such. They are probably included in the number of Irkutsk-built IL-28Rs and IL-28 bombers (built elsewhere) respectively.

CHAPTER FOUR

The IL-28 family

The IL-28 soon became the progenitor of a whole family. Some of the more or less specialised versions were built (or converted) in quantity, seeing operational service; others were one-off machines used for test and development work. Known versions are described below.

IL-28 *Beagle* bomber with VK-1/VK-1A engines (*izdeliye* 5)

As mentioned in the preceding chapter, the basic bomber version was built in Moscow, Voronezh, Omsk, Kuibyshev and Irkutsk; the first production aircraft left the Moscow production line at MMZ No.30 in March 1950 and the final bombers left the Irkutsk production line in late 1956. The Irkutsk-built bombers, which were manufactured exclusively for export in 1955-56, were known at the factory by the unofficial designation IL-28B.

Various improvements were introduced in the course of production; some of them have been listed in Chapter 3 – such as air bleed valves preventing engine surge, improved IL-K6-51 (IL-K6M) and IL-K6-53 versions of the tail turret and a more advanced SP-50 Materik ILS replacing the earlier OSP-48 ILS. In addition, the IL-28 received more effective formation lights for station-keeping during flights of bomber formations at night.

Four shut-off valves were introduced in the fuel system to seal off a punctured tank in the event of battle damage, preventing loss of fuel; eventually the *Beagle* got self-sealing fuel tanks which theoretically took care of the problem. The No.3 fuel tank was divided into tanks Nos. 3A and 3B whose capacity was carefully calculated in order to preserve the CG position as the fuel was burned off, obviating the need for fuel transfer. However, some sources claim that the CG shift problem associated with fuel burn-off still was there; it was, in fact, the IL-28's only major shortcoming which was never eliminated due to the lack of an automatic fuel management system maintaining CG position. Since the forward fuselage tanks accommodated more fuel than the rear

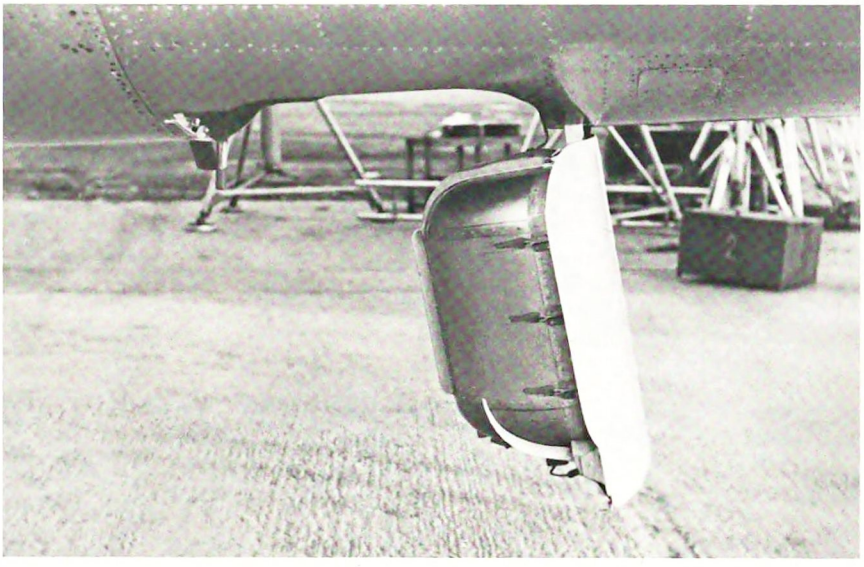
IL-28 '85 Blue' shows off its underside with a lot of operational soot and dirt deposits.

fuselage tanks, the CG gradually shifted forward. This was especially unwelcome during landing; the pilot had to keep an eye on the fuel meters and activate the fuel transfer pump at the right moment. The pump worked slowly, and as the pilot had to concentrate on flying the aircraft during the landing approach he often forgot to switch it off in time. As a result, the CG would now be too far aft and the aircraft assumed an excessively nose-high attitude, with high angles of attack that were difficult to counter with elevator input. To avoid this, IL-28 pilots would ask the navigators to remind them to switch off the pump.

As mentioned earlier, on IL-28 *sans suffixe* c/n 50301801 (the pattern aircraft for 1951 production, stated in the Ilyushin OKB test report as c/n 51301801) was used in May 1951 to test a number of important changes introduced after the state acceptance trials and service evaluation (the evaluation report had been endorsed on 4th November 1950). In particular, the pilot's canopy was modified to facilitate opening from inside with one hand (an asset if the pilot was wounded) and from outside; the port side emergency exit of the gunner's station was provided with an external opening handle. Internal handles were added in the gunner's station; the navigator's seat harness was revised for quicker buckling up/unbuckling when he switched seats in flight, and the emergency jettison mechanism of the navigator's entry hatch was altered. Measures were taken to reduce structural weight, lightening the rear fuselage and tail section (i.e., the gunner's station) by 40 kg (88.2 lb) and the tail surfaces by 48.8 kg (107.6 lb). The bomber had the new IL-K6M tail turret and the SP-50 ILS; the pilot's and navigator's windshields received an electric de-icing system. An AKS-1 cine camera (*appa**raht** kino**syom**ochnyy*) slaved to the cannons was installed on the port side of the turret, with a travel slot for the lens; this feature was not put into production.

Ilyushin OKB chief test pilot Vladimir K. Kokkinaki was the project test pilot, with M. A. Kutepov as engineer in charge of the flight tests. Performance and handling were almost identical to those of earlier production machines, except that the rudder pedal forces were slightly reduced. The test flights included structural strength checks at the dynamic pressure limit corresponding to an indicated airspeed of 800 km/h (496 mph) and at the G limit of 4.4 Gs, which the aircraft withstood without permanent structural deformation. The windscreen de-icer worked well but generated reflections in sunny weather.

Pretty soon after the IL-28's production entry a brake parachute installation was developed pursuant to a MAP order dated 11th January 1951 to shorten the landing run on short or slippery runways. The PB-28 single-canopy ribbon-type circular parachute (*para**shoot** bombardi**rov**shchika* – bomber-type [brake] parachute for the IL-28) was stowed in a container with clamshell doors built into the avionics/equipment bay door on the rear fuselage underside. This door was aft-hinged rather than sideways-opening (the standard door was hinged on the starboard side) – apparently to minimise the inconvenience created by the parachute



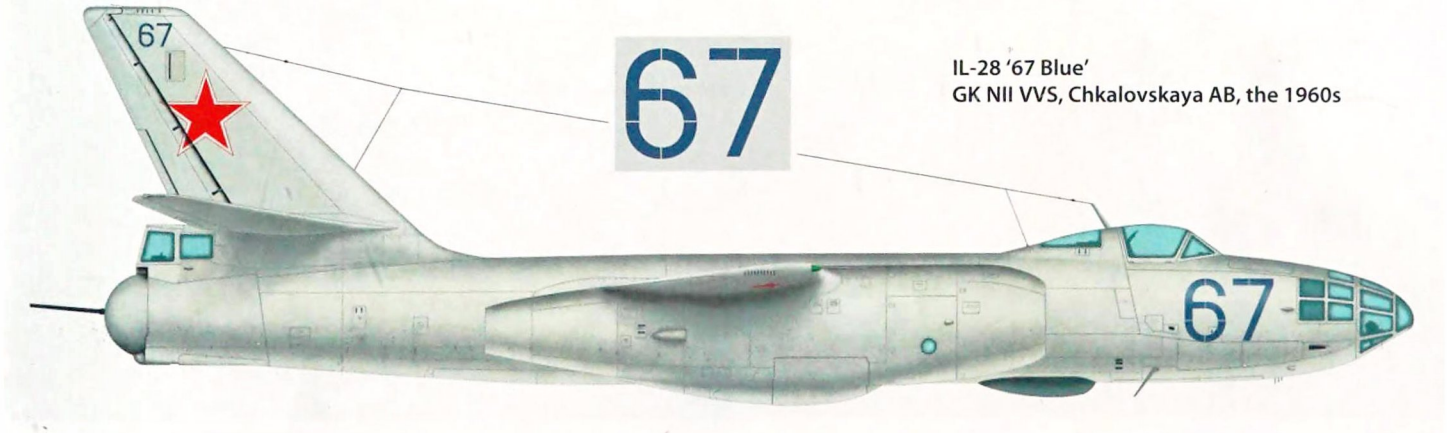
The rear avionics bay cover of IL-28 c/n 530512007 opened to reveal the then-experimental PB-28 brake parachute installation.

Seen through the cross-hairs of a photo theodolite, IL-28 c/n 530512007 streams the brake parachute on landing at Zhukovskiy.

'67 Blue', an IL-28 operated by GK NII VVS, on the hardstand at Chkalovskaya AB.

Another view of the same aircraft. Colour photos of operational Soviet Air Force IL-28s are very rare.

container during access to the bay; the container retaining lock was at fuselage frame 38. This feature was tested on a Moscow-built IL-28 *sans suffixe* (c/n 530512007) at Zhukovskiy on 27th March – 9th April 1951 with satisfactory results. Again, the aircraft was flown by Vladimir K. Kokkinaki, with A. P. Vinogradov as the navigator, N. D. Sorokin as the flight engineer and M. N. Zooyev as engineer in charge of the flight tests. With a normal landing weight of 16,000 kg (35,270 lb) the brake parachute reduced the landing run by 260 m (850 ft) or 32%; at the maximum landing weight of 18,400 kg (40,570 lb) the reduction amounted to 375 m (1,230 ft) or 33%. The best results were obtained when the parachute was deployed at the moment of



IL-28 '67 Blue'
GK NII VVS, Chkalovskaya AB, the 1960s

touchdown. On the other hand, using automatic brake controls in conjunction with the parachute did not yield any additional reduction. Parachute deployment was not accompanied by a perceptible jolt, nor did the parachute impair directional stability during the landing run. Packing and installing the brake parachute was a labour-intensive affair – it took three technicians 26-29 minutes; however, the report stated that the time could be significantly reduced and the operation performed by two men, providing certain design changes were made. A while later IL-28 c/n 530512007 passed state acceptance trials and the brake parachute installation was introduced on production *Beagles*.

New ejection seats were developed, replacing the earlier model; these featured leg restraints, a face protection visor and a harness tightening mechanism. The seats underwent joint state acceptance trials by the Air Force and MAP in 1951, followed by Air Force evaluation in 1953.

However, everything comes at a price, and these modifications were expected to increase empty weight by 240 kg (529 lb). Hence Ilyushin OKB engineers took measures to offset this weight penalty, lightening the rear fuselage structure, tail unit and tail turret (the new versions of the IL-K6 were not only more capable but also lighter), removing the anti-flutter weights from the wings and so on.

In addition to the standard PSR-1500-15 JATO boosters, consideration was given to equipping the IL-28 with two SU-1500 reusable boosters (***star****tovyy ooskor****it****el'* – take-off booster) which could be used up to 60 times. Unlike the former model, the SU-1500, which was developed at Aleksey M. Isayev's OKB-2 under the guidance of designer V. N. Bogomolov, was a liquid-propellant booster running on kerosene, with nitric acid as the oxidiser. According to the specifications issued back in 1946, the SU-1500 was to have a dry weight of 100 kg (220 lb), an operating weight of 300 kg (660 lb) and deliver 1,500 kgp (3,310 lbst) with a burn time of 20 seconds. After burnout the jettisoned boosters descended by parachute, the rocket motor being protected from damage on touchdown by special deformable plates on the booster's body which absorbed the impact energy.

The SU-1500 passed its state acceptance trials in 1952; later that year four IL-28s were equipped with such boosters for service evaluation. Yet the SU-1500 did not enter production because the disposable solid-fuel boosters were more convenient to use.

IL-28 bomber with Rym-S targeting system

As mentioned in Chapter 3, the electronics industry could not supply enough PSBN-M radars for all IL-28 bombers being produced. This was apparently the reason why a considerable number of *Beagles* was completed with an alternative targeting system called Rym-S (the Russian word *rym* – originally a nautical term of Dutch origin – means 'ring bolt'). This was a rangefinding system that allowed the bomber to attack a stationary target with known co-ordinates, using triangulation from a pair of transmitter sites.

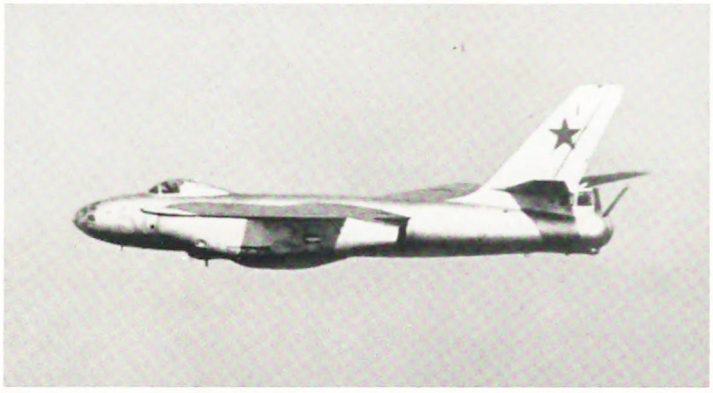
The aircraft was equipped with a Rym-S receiver; the S denoted *samo****lyot****naya* [*appara****too****ra*] – aircraft-mounted equipment, referring specifically to the on-board part. Outwardly such IL-28s could be identified by the rod aerial protruding vertically downward from the radome; the latter was identical in shape and size to that of the PSBN-M radar but housed the targeting system receiver. The remainder of the system was a pair of

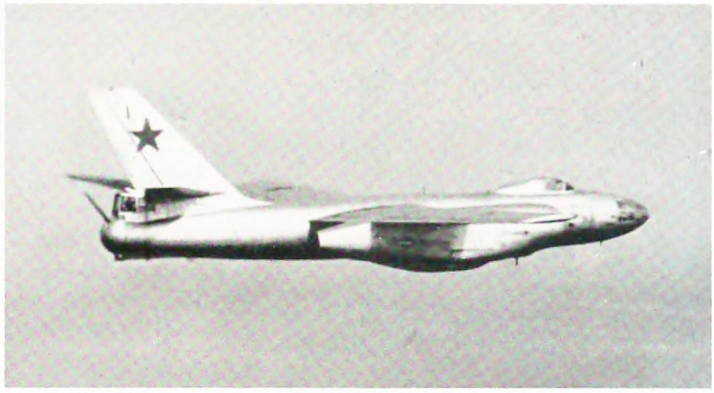
IL-28 '15' is equipped with a Rym-S distance measuring targeting system instead of the PSBN-M radar, as the rod aerial protruding vertically from the radome reveals.

Rym-B ground-based (truck-mounted) or heliborne mobile transmitters. In addition to its primary purpose, the system could be used for navigation, making it possible to determine the aircraft's position and ground speed.

The Rym system ensured reasonably high bombing accuracy but was inconvenient to use – only one avenue of approach was possible, as the bomber had to orbit one of the two transmitters, maintaining a constant distance from it (this was known as a 'combat orbit').

Two views of '35 Blue' (c/n 55007170), another IL-28 equipped with the Rym-S system.





Above and above right: Air-to-air shots of IL-28 '51 Blue' with the Rym-S system.

Below right: The forward fuselage of the IL-28U trainer undergoes static tests.

Bottom: The unserialled first prototype of the IL-28U during Soviet Air Force evaluation in the early 1950s.

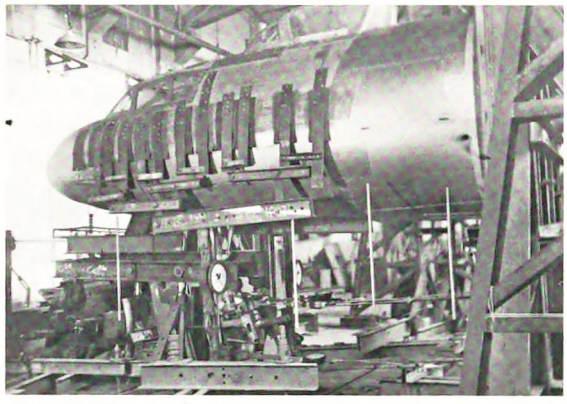
Opposite page, top: One of the IL-28U prototypes is readied for flight at a snowbound airbase.

Opposite page, centre and bottom: IL-28U '22 Blue' at GK NII VVS during state acceptance trials.

Also, the reliability of the transmitters left a lot to be desired. Later, in the 1960s, the Rym evolved into the DBS-2 Lotos system (Lotus; DBS = *dahl'no**mer**naya bombardi**rov**ochnaya sis**tem**a* – rangefinding bombing system) fitted to the Yakovlev Yak-28L *Brewer-B* supersonic bomber; it worked with the same Rym-B transmitters but allowed greater operational flexibility.

IL-28U *Mascot* conversion trainer (*izdeliye* 6)

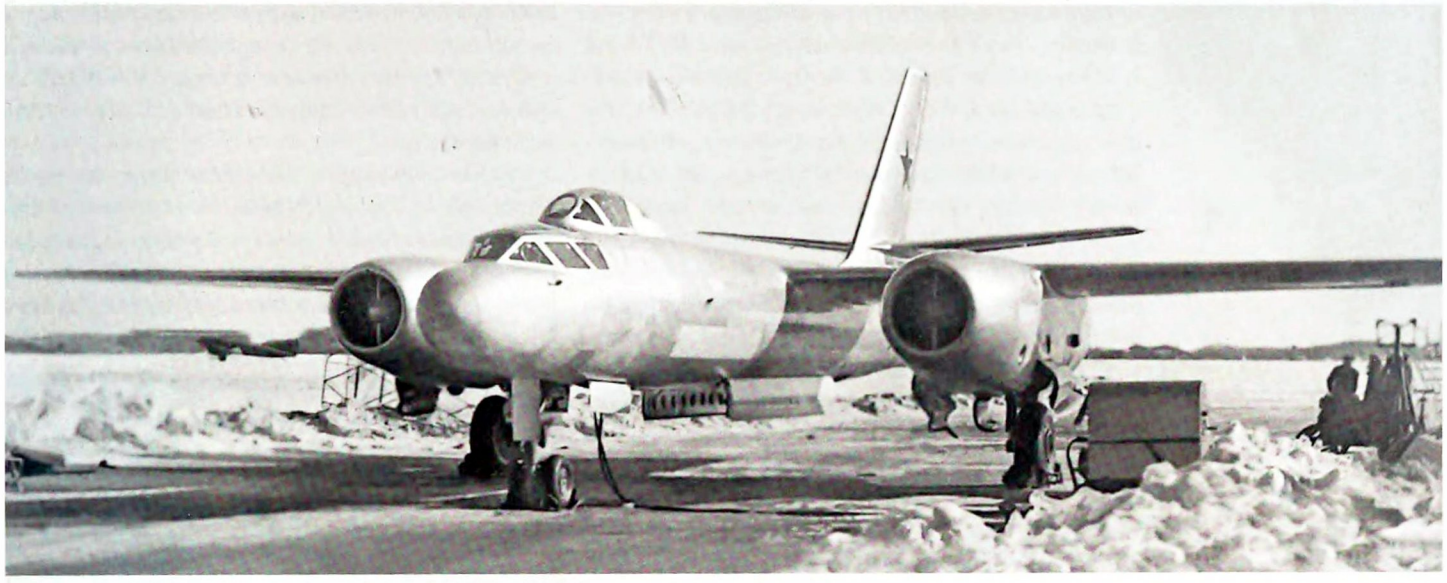
Specialised versions began appearing before long. Predictably, the first of these was a conversion trainer



easing the transition from piston-engined types to the jet bomber. OKB-240 was immediately tasked with creating such an aircraft; development work began in September 1949, and on 14th October General Designer Sergey V. Ilyushin approved the ADP of the IL-28U (*oo**cheb**nyy* [*samo**lyot***] – trainer) powered by VK-1 engines. In some sources the aircraft was erroneously called UIl-28 – obviously by analogy with the wartime UIl-2 (IL-2U) and UIl-10 (IL-10U) attack aircraft. The Council of Ministers directive officially sanctioning development of the trainer version appeared in November 1949.

The IL-28U differed from the bomber primarily in having a new nose grafted on in place of the extensively glazed navigator's station (up to fuselage frame 6). It housed the instructor's cockpit accessible from above, with a parabolic nosecone and a stepped windscreen, rather like the flight deck of an airliner *en miniature*; the trainee pilot sat in the standard cockpit. According to some Western authors, *'what Ilyushin did was the best way to ruin the sleek lines of the IL-28'*; the result certainly looked bizarre but both the trainee and the instructor enjoyed an unrestricted field of view.

The trainee's cockpit was virtually identical to that of the standard bomber except for a cut-out in the



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instrument panel permitting visual contact with the instructor, which required some of the flight instruments to be relocated. The front cockpit featured a complete set of flight controls and instruments; the instructor had complete control over the trainee's actions and could take over if necessary by flipping some switches, barring the trainee from flying the aircraft.

All armament and bomb-aiming equipment was deleted, the IL-K6 turret being replaced by a hemispherical fairing and the cut-out for the radar antenna being faired over. Still, the IL-28U could be used for training GROs, for which the former gunner's station was suitably equipped. Because of the limited duration of a typical training sortie the fuel capacity was reduced to 6,600 litres (1,452 Imp gal) and the fuel load to 5,500 kg (12,125 lb). To maintain the proper CG position the tail turret was substituted by 250 kg (551 lb) of ballast on the prototype. According to OKB calculations, production aircraft were to have 200 kg (440 lb) of ballast but it was found possible to reduce this to 130 kg (286 lb).

Other changes included removal of the RV-10 radio altimeter (and the associated inboard pair of dipole aerial under the wing roots) and the fuel tanks' inert gas pressurisation system. The IL-28U was equipped with an RSIU-3B radio (instead of the bomber's RSU-5), an AP-5 autopilot, a ***Ba**riy-M* (Barium-M) IFF transponder, an SPU-5 intercom, an RV-2 radio altimeter and an SP-50 Materik-B ILS with SD-1 distance measuring equipment (*samo**lyot**nyy dahl'no**mer*** – aircraft-mounted range-finder).

On 21st February 1950 a standard *Beagle* was delivered to the Ilyushin OKB's experimental shop at Khodynka (MMZ No.240) straight off the MMZ No.30 production line for conversion into the first prototype IL-28U. The conversion was completed in less than a month; piloted by Vladimir K. Kokkinaki, the unserialled aircraft took to the air on 18th March, with B. A. Golubev as flight engineer (in the instructor's seat) and B. A. Yerofeyev as radio operator. A. P. Vinogradov was the engineer in charge of the flight tests.

A second prototype joined the test programme shortly afterwards. It was serialled '22' and differed from the first machine in that the cockpit's direct vision window was located on the hinged canopy section, not on the port sidelight of the fixed windshield. Also, the star insignia on the vertical tail was moved aft and down to make room for the serial.

The trainer's performance and handling were virtually identical to those of the bomber, except for the marginally better rate of climb. The IL-28U was stable throughout its flight envelope, remaining well balanced at Mach 0.78. It performed all manoeuvres the bomber version was to make; turns with 70-80° bank could be made without any trouble and the aircraft gained 2,000 m (6,560 ft) during a yo-yo manoeuvre. Flying the aircraft from the instructor's seat was just as simple and enjoyable as from the rear cockpit. Like the other versions, the trainer could be fitted with PSR-1500-15 JATO boosters.

The manufacturer's flight test programme was completed on 30th March 1950. By then the 45th BAP (*bombardi**rov**ochnyy **avia**polk* – Bomber Regiment, ≈ Bomb Squadron, in US terms) of the 56th BAD (*bombardi**rov**ochnaya **a**viadi**vee**ziya* – Bomber Division, ≈ Bomb Group) was taking delivery of production IL-28

The specifications of the IL-28U prototype obtained at the manufacturer's flight tests

Length overall	18.0 m (59 ft 0 21/32 in) [1]
Height on ground	6.0 m (19 ft 8 7/32 in)
Wing span	21.45 m (70 ft 4 31/64 in)
Wing area	60.8 m² (653.76 sq. ft)
Wing loading	288 kg/m² (59 lb/sq. ft)
Power loading at sea level	3.25 kg/kgp (lb/lbst)
Operating empty weight	11,760 kg (25,925 lb) [2]
Normal all-up weight	17,560 kg (38,710 lb)
Payload	5,800 kg (12,790 lb)
Fuel load	5,500 kg (12,125 lb)
Maximum speed:	
at 3,000 m (9,840 ft)	843 km/h (523 mph)
at 5,000 m (16,400 ft)	820 km/h (509 mph)
Rate of climb at sea level with a 17,020-kg (37,520-lb) TOW	17.0 m/sec (3,345 ft/min)
Climb time to 5,000 m with a 17,020-kg TOW	5.5 minutes
Maximum range with a 17,020-kg TOW	2,400 km (1,490 miles)
Take-off run	800 m (2,620 ft) [3]
Landing run	1,170 m (3,840 ft) [3]

Notes:
1. Often cited as 17.65 m (57 ft 10⅞ in) which is the fuselage length
2. With 250 kg (551 lb) of ballast.
3. Ilyushin OKB data.

bombers. Therefore it was decided to loan the IL-28U prototype (it is not known which one) to that unit for evaluation in order to speed up conversion training. This enabled the 45th BAP to achieve initial operational capability in time to participate in the 1950 May Day parade in Moscow's Red Square (which of course was largely a matter of prestige); the trainer prototype took part in this parade together with production *Beagles*. After this the IL-28U was turned over to GK NII VVS for state acceptance trials which took place on 13th-27th May, lasting a mere two weeks; Mikhail P. Subbotin was the institute's project test pilot, with V. A. Shoobralov as engineer in charge. The trials report was signed by

Soviet Air Force Commander-in-Chief Air Marshal Pavel F. Zhigarev on 8th June.

The IL-28U entered production pursuant to an MAP order dated 21st July 1950, the first eight production machines being completed that year. The trainer version was built exclusively by MMZ No.30 in Moscow, which manufactured a total of 1,405 in 1950-55; the in-house product code was *izdeliye* 6. It was customary for Soviet OKBs to hold repeat static tests, checking production aircraft for conformity to structural strength standards; an IL-28U forward fuselage pulled off the assembly line passed such tests successfully in 1954.

The type remained the principal trainer for Soviet and Warsaw Pact tactical bomber pilots well into the 1970s. At the time trainer versions of Soviet combat aircraft were assigned separate NATO reporting names in the 'miscellaneous aircraft' category (a practice later discontinued in favour of suffix letters); accordingly the IL-28U was codenamed *Mascot*. On production IL-28Us the empty operating weight rose to 11,900 kg (26,230 lb) and the all-up weight to 17,700 kg (39,020 lb), the reduction in ballast notwithstanding.

The transition from the IL-28U to the bomber version did not require additional training. The state acceptance trials report said that a pilot with 350-400 hours' total time on anything from the Polikarpov U-2 (Po-2) *Mule* basic trainer to the Tu-2 bomber could fly the IL-28 solo after only two to four flights on the trainer version. The Naval Aviation (AVMF – *Aviah*tsiya *Voyen*no-mor*sko*vo *flot*a) also operated the *Mascot*; the first naval aviation unit to receive the IL-28U in October 1951 was the 943rd MTAP (***min***no-tor***ped***nyy ***a***via***polk*** – Minelayer & Torpedo-Bomber Regiment).

IL-28U ejection trainer version

On 10th December 1953 MAP issued an order requiring a version of the IL-28U modified for training *Beagle* crews in ejection techniques to be developed (in similar manner to the Mikoyan/Gurevich UTI MiG-15stk, a special ejection trainer version of the *Midget* advanced trainer). The aircraft's *raison d'être* was that the crews were apprehensive about the bomber's first-generation ejection seat, fearing serious injuries in the event of an ejection at low altitude or on landing when most accidents happen. It was necessary to overcome this psychological obstacle and build up the pilots' confidence in the aircraft.

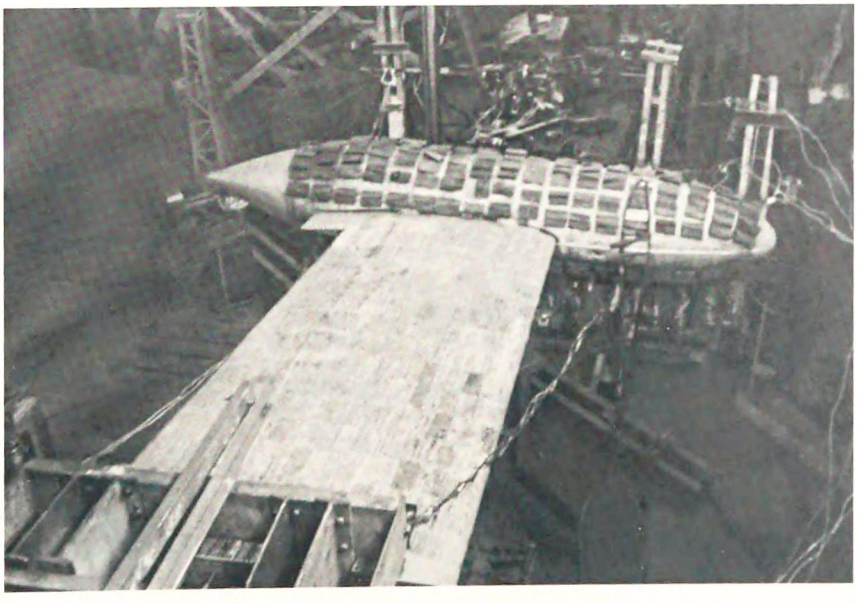
The Ilyushin OKB delivered a set of manufacturing documents for the ejection trainer to MMZ No.30 on 5th March 1954. It is not known how many *Mascots*, if any, were built in this configuration.

IL-28R tactical reconnaissance aircraft (*izdeliye* 4)

The second specialised version, which followed hot on the trainer's heels, was the IL-28R ([*samo**lyot***-] *raz**ved**chik* – reconnaissance aircraft). It was intended for tactical photo reconnaissance (PHOTINT) to meet the objectives of fronts, fleets and air armies.

For daylight missions the aircraft could carry an equipment suite comprising four cameras – two AFA-33/100s or AFA-33/75s with a focal length of 1,000 or 750 mm respectively in the forward and centre parts of the bomb bay on AKAFU mounts (*avtoma**tich**eskaya ka**cha**yushchaya **a**ero**fot**ousta**nov**ka* – automatic tilting mount for aircraft cameras) permitting two-strip or four-strip high/medium-altitude photography, one AFA-33/20 or AFA-42/20 (AFA-RB/20) vertical camera with a 200-mm lens in the rear part of the bomb bay and one AFA-33/50 or AFA-33/75 oblique camera with a 500-mm or 750-mm lens mounted on the port side in a special rear fuselage bay with a camera port closed by clamshell doors. The oblique camera could be installed at a preset angle of 9°, 15°, 30° or 45° to the vertical. Alternatively, some aircraft were fitted with two AFA-42/100 or AFA-42/75 cameras on the forward mount. The navigator acted as the camera operator.

For night sorties the IL-28R was configured with either two NAFA-3S/50 cameras (*noch**noy** **a**ero**fo**-**to**ppa**raht*** – aircraft camera for night operations) or a single NAFA-MK-75 or NAFA-MK-50 camera in the forward part of the bomb bay. The rest of the bay was occupied by twelve 50-kg (110-lb) FotAB-50-35 flash bombs (*fotogra**fich**eskaya **a**via**bom**ba* – 'photo bomb') which triggered the camera shutters; this number was reduced to six if a long-range fuel tank was fitted. The bombs were dropped, using an NKPB-7 bomb sight (*noch**noy** *kolli**mah**tornyy pri**tsel** bombardi**rov**shchika* – bomber-type collimator sight for night operations) which could be used at up to 11,500 m (37,730 ft). It should be noted that one Russian source gives rather different data: three AFA-33 cameras with varying focal lengths (1,000, 750 and 200 mm) and one AFA-RB

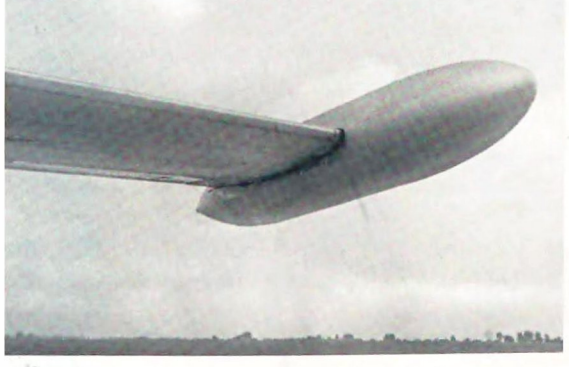


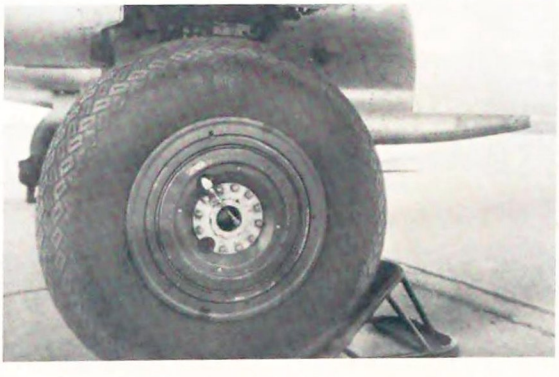
A specimen of the IL-28R's tip tanks undergoes static tests.

camera for daylight sorties or two NAFA-3S cameras assisted by FotAB-100-60 or FotAB-50-35 flash bombs, SAB-100-55 or SAB-100-35 flare bombs (*svet**ya**shchaya **avia**bom**ba***) for night sorties.

The bomb bay doors did not feature camera windows and were simply opened before the photo run. The cameras were installed in special containers heated by air from the environmental control system to prevent the lubricant from freezing at high altitude; the night cameras, however, did not have such containers. An electric heating system for the cameras was also provided; it was switched on 15 minutes before the

Top and above: The prototype of the IL-28R reconnaissance aircraft; note the twin dorsal aerials and the lack of the starboard nose cannon.





Opposite page: The same aircraft with tip tanks fitted.

Far left: The port tip tank of an IL-28R.

Left: The IL-28R had new main gear units with hydraulic actuation and larger wheels with a spin-up feature.

A production IL-28R coded '03 Red' taxies out for take-off with the flaps set 20°. Note the black anti-glare panels applied to the tip tanks.

actual photo run if the ambient temperature was –15°C (5°F) or lower.

The standard PSBN-M radar was also used for reconnaissance to a certain extent; the image on the radar display was recorded by a special FRL-1M camera (***fot****opri****stahv****ka* ***rah****diolo****ka****tora* – photographic add-on to radar).

For overwater missions the IL-28R carried an LAS-3 inflatable rescue dinghy (***lod****ka ava****reey****no-spa****sah****tel'-naya*) in a container with a dorsal cover at the front end of the bomb bay. This could be released either by the pilot or the GRO and was inflated automatically by a rip cord after leaving the container.

The photo equipment and the rescue dinghy necessitated removal of the standard No.3 fuel tank. To compensate for this and extend range, a 750-litre (165 Imp gal) tank was installed in the rear portion of the bomb bay, and two 950-litre (209 Imp gal) cylindrical metal tanks were fitted at the wingtips. This amounted to 1,642 litres (361.24 Imp gal) of extra fuel as compared to the bomber, increasing overall fuel capacity to 9,550 litres (2,101 Imp gal) and the fuel load to 8,000 kg (17,640 lb). Some sources erroneously quote the IL-28R's fuel capacity as 10,560 litres (2,323.2 Imp gal) and the increase as 2,660 litres (585.2 Imp gal). Apart from the 9,550-litre maximum fuel option with all tanks full, the following fuel options were possible: 8,800 litres (1,936 Imp gal, main fuselage tanks plus tip tanks), 7,650 litres (1,683 Imp gal, main fuselage tanks plus additional fuselage tank), and 6,900 litres (1,518 Imp gal, main fuselage tanks only). The increased mission time (up to five hours) necessitated the provision of additional oxygen for the crew.

The tip tanks were detachable and could be jettisoned in an emergency – for example, in the event of asymmetric fuel usage (landing with one tank full and the other tank empty was impossible because at low speed there was insufficient aileron authority to counter the roll in the direction of the full tank). Hence they are often described as drop tanks; however, they carried the navigation lights, suggesting the tip tanks were not supposed to be jettisoned unless absolutely necessary. Installation of the tip tanks caused the pitot mounted at the starboard wingtip to be relocated and necessitated changes to the wing de-icers whose air outlets were located further inboard, not in the wingtip fairings.

The reconnaissance version's MTOW was 22,685 kg (50,010 lb), which was higher than the bomber's; some sources claim that, depending on the camera suite, it could reach 22,720 kg (50,090 lb). Therefore the main landing gear units were reinforced and fitted with larger 1,260x390 mm (49.6x15.35 in) wheels instead of the usual 1,150x355 mm (45.27x13.97 in) wheels. This required the engine nacelles to be widened in the area of the wheel wells and gave the IL-28R a different ground angle; hence the rear end of the open gunner's station hatch was at knee level instead of almost at ground level. Additionally, the landing gear was actuated hydraulically, not pneumatically, and retracted in just eight seconds – much faster than on the standard bomber. The IL-28R's higher gross weight also led the designers to introduce a unique feature minimising wear and tear on the tyres: the mainwheels were spun up by GM-13 hydraulic motors (***ghid****romo****tor***) when the gear was extended; this resulted in an exceptionally smooth touchdown. The hydraulic motors were

switched on by the pilot on final approach at an altitude of 300-400 m (980-1,310 ft) and switched off after flap retraction in the event of a go-around.

Due to the installation of camera controls and the forward shift of the CG position the starboard forward-firing cannon was deleted as a weight-saving measure. The PSBN-M radar was sometimes removed as well; in that case 110 kg (242.5 lb) of ballast were carried in the navigator's compartment for CG reasons. Some changes were made to the avionics fit; the IL-28R featured a ***Mag**niy-M* (Magnesium-M) IFF interrogator, an RSB-5 communications radio with a US-P receiver, an RSIU-3 command radio, an SPU-5 intercom, RV-2 and RV-10 radio altimeters, an SP-50 ILS etc.

On 5th March 1950 a Moscow-built IL-28 powered by VK-1 engines was delivered to MMZ No.240 for conversion into the IL-28R prototype. The unserialled aircraft was submitted for manufacturer's flight tests on 18th April 1950, making its first flight on 19th April – one month and one day after the maiden flight of the IL-28U; it was flown by pilot Vladimir K. Kokkinaki, flight engineer I. B. Küss and radio operator B. A. Yerofeyev. Once again A. P. Vinogradov was in charge of the flight tests, with M. I. Nikitin as his assistant. The prototype had an extra dorsal blade aerial amidships, which was absent on production machines; it was tested both with and without the tip tanks.

The performance of the IL-28R was broadly similar to that of the bomber, except that range in high-altitude cruise increased to 3,150 km (1,960 miles); the combat radius was 740 km (459 miles) at 5,000 m (16,400 ft) and 1,140 km (710 miles) at 10,000 m (32,810 ft). With the tip tanks installed, indicated airspeed in 'clean' configuration (gear up/flaps up) was limited to 750 km/h (465 mph) at up to 4,000 m (13,120 ft) and Mach 0.78 above that altitude. Kokkinaki reported that handling and cockpit visibility remained unchanged. High-speed aerial photography at various altitudes did not require special piloting techniques. The autopilot, as well as the heated and pressurised cockpits, reduced crew fatigue, which was especially important for a reconnaissance aircraft with its long missions.

A performance comparison of the production IL-28 and IL-28R

	IL-28	IL-28R
Empty weight, kg	12,720 (28,040)	13,250 (29,210)
All-up weight, kg (lb):		
normal	18,400 (40,560)	20,020 (44,135)
maximum	22,000 (48,500)	22,490 (49,580)
Fuel capacity, litres (Imp gal)	7,908 (1,739)	9,550 (2,101)
Top speed, km/h (mph)		
at altitude, m (ft)	902 (560)	876 (544)
	4,500 (14,760)	5,000 (16,400)*
Service ceiling, m (ft)	12,400 (40,680)	12,300 (40,350)
Time to service ceiling, minutes	37	42
Range, km (miles):		
at 5,000 m (16,400 ft)	1,790 (1,111)	2,020 (1,242)
cruising at, km/h (mph)	556 (345)	547 (339)
at 10,000 m (32,810 ft)	2,450 (1,521)	2,780 (1,726)
cruising at, km/h (mph)	698 (433)	670 (418)
at 10,000 m	2,580 (1,602)	3,040 (1,888)
cruising at, km/h (mph)	690 (431)	670 (418)

* The IL-28R's indicated airspeed below 4,000 m (13,120 ft) was limited to 750 km/h (468 mph); the Mach limit at higher altitudes was 0.78.

A peculiarity of the IL-28R was the forward shift of the CG position. At an all-up weight of 20,760 kg (45,770 lb) with the gear down and the flaps deployed, the CG was at 20.7% MAC versus 21.4% MAC for the bomber. As a result, the force with which the pilot had to pull the control yoke to achieve rotation on take-off was doubled – from 6 to 12 kgf (from 13.2 to 26.4 lbf). If the tail turret's ammunition boxes were empty, the CG was at 18.3% MAC and the force required to achieve rotation rose to 16 kgf (35.2 lbf).

Initial flight testing was completed on 27th June 1950, General Designer Sergey V. Ilyushin endorsing the test report three days later. On 18th October 1950 the IL-28R was submitted for state acceptance trials at NII VVS; after completing the trials on 23rd November it was ordered into production by Council of Ministers directive No.4858-2111ss on 8th December 1951 and joined the VVS inventory. Initially the reconnaissance

A field performance comparison of the bomber and reconnaissance versions

	Take-off weight,kg (lb)	Unstick speed,km/h (mph)	Take-off run,m (ft)	Landing speed,km/h (mph)	Landing run,m (ft)
a) paved runway					
IL-28	20,100 (44,310)	240 (149)	1,400 (4,590)	200-205 (124-127)	1,500 (4,920)
IL-28R	19,800 (43,650)	259 (160)	1,610 (5,280)	220-225 (136-139)	1,620 (5,315)
IL-28R	22,200 (48,940)	274 (170)	2,150 (7,050)	220-225 (136-139)	1,620 (5,315)
b) unpaved runway					
IL-28	20,100 (44,310)	240 (149)	1,700 (5,580)	200-205 (124-127)	1,200 (3,940)
IL-28R	19,800 (43,650)	259 (160)	1,720 (5,640)	220-225 (136-139)	1,300 (4,265)
IL-28R	22,200 (48,940)	274 (170)	2,300 (7,550)	220-225 (136-139)	1,300 (4,265)

version was built in Moscow; in 1953, when MMZ No.30 had completed 182 examples, IL-28R production was transferred to plant No.39 in Irkutsk which had previously built the Tu-14T. This manufactured a further 324 aircraft in 1953-56, bringing the total to 506. The IL-28R's product code at both factories was *izdeliye* 4.

Somewhat surprisingly, even though the reconnaissance version differed visibly from the bomber, the ASCC did not take the logical step of assigning suffix letters to the reporting name (hypothetically, '*Beagle-A*' for the IL-28 *sans suffixe* and '*Beagle-B*' for the IL-28R); it was still simply *Beagle*.

Starting in 1952, a small number of IL-28Rs were completed with a different radar – the Koors (Heading) search radar. This was housed in a much deeper teardrop radome and theoretically was capable of detecting a destroyer-sized surface ship at up to 65 km (40.39 miles) range from 10,000 m (32,810 ft). The Koors radar was officially included into the inventory by a Council of Ministers directive dated 12th December 1953. IL-28Rs thus equipped served with the Soviet Navy; for example, all *Beagles* operated by the North Fleet's 967th ORAP (*ot**del'**nyy raz**ved**yvatel'nyy **avia**polk* – Independent Reconnaissance Air Regiment) were thus equipped. However, the Koors radar did not offer any major advantage over the standard PSBN-M radar; moreover, it was singularly unreliable and thus did not find wide use.

Finnish Air Force IL-28Rs had alternative western camera installations because the standard Soviet ones were deemed unsatisfactory. The cameras used were the West German Zeiss Pleogon RMKA 15/23 with a 153-mm lens; the West German Rb 20/30 with a 200-mm lens and 60 m (196 ft) of film giving 180 30x30 cm (11 13/16 in x 11 13/16 in) exposures; the American Fairchild FRD-K 38 with a 920-mm lens and 120 m (393 ft) of film giving 240 23x45 cm (9 3/64 in x 17 23/32 in) exposures; and the British Vinten G 95 Mk 2 giving 500 55.5x57 mm (2 3/16 in x 2 15/64 in) exposures.

The Vinten G 95 was used for low-altitude photography during maritime surveillance sorties, and the aircraft carried six such cameras (Nos. 2-7) – three in the bomb bay on a special rack and three in the rear fuselage avionics/equipment bay. The Nos. 2 and 3 cameras were installed obliquely with 300-mm lenses; the other four were vertical with 98-mm lenses. Together the six cameras gave a field of view of 83° to port and 43° to starboard. Two of the three Finnish IL-28Rs – NH-3 (c/n 5901713) and NH-4 (c/n 5901106) – were thus equipped.

Interestingly, the Fairchild camera was 'Cold War booty' – it had been confiscated from the Americans when they were caught in the act of spying (an aircraft operating for the US Embassy in Helsinki was intercepted and forced down at a Finnish airbase after straying off its designated route to photograph Finnish military installations)! Unabashed, the Americans sent the camera's manual and fresh film to the Finns – 'they won't return it anyway, so they might just as well use it'.

IL-28 experimental torpedo-bomber conversion

The *Beagle* entered service with the Soviet Naval Aviation in August 1951; it suited the Soviet Navy better than the Tu-14, being lighter and more agile. Initially the naval IL-28s were operated in standard bomber configuration; however, as early as 1st June 1950 the Council of Ministers ordered the development of a specialised torpedo-bomber version.

Development of a practical jet torpedo-bomber turned out to be arduous. In the first iteration, which did not even have a proper designation, the bomb bay was modified to carry one RAT-52 rocket-propelled torpedo internally. The RAT-52 (*re'ak**tiv**naya aviatsi**on**naya tor**ped**a* – jet-powered aerial torpedo, 1952 model), as it was designated upon inclusion in the AVMF inventory, had been under development since 1945 – initially at NII-1 within the framework of the Ministry of Agricultural Machinery (which developed munitions, among other things!), and then, from 1946 onwards, at NII-2 within the MAP framework. NII-2 was subsequently reorganised as the State Research Institute of Aircraft Systems (GosNII AS – *Gosu**dar**stvennyy na**ooch**no-is**sled**ovatel'skiy insti**toot** aviatsi**on**nykh sis**tem**),

This IL-28 is a torpedo-bomber prototype with non-standard bulged bomb bay doors to accommodate two RAT-52 torpedoes internally. Note the longer fairing aft of the cockpit accommodating a rescue dinghy.

becoming the leading Soviet integrator of avionics and weapons.

The RAT-52 had been conceived as a homing torpedo, but the guidance system proved to be beyond the capabilities of the design team, requiring fundamental research. Hence the system was omitted in the final version – all the more so because it was superfluous, given the torpedo's short range. The RAT-52 was designed for high-altitude delivery (from 1,500-4,000 m/4,920-13,120 ft) and equipped with a parachute system and ailerons, making sure it stayed on the aircraft's course during the aerial segment of the trajectory. Together with the parachute system the torpedo weighed 627 kg (1,382 lb) and had a 243-kg (535-lb) warhead of TGA explosive (*tro**til**, ghekso**ghen**, alyu**min**iy*, a trotyl/RDX/aluminium powder compound) detonated by two impact fuses.

The RAT-52 was 3,897 mm (12 ft 9$^{27}/_{64}$ in) long, with a calibre of 450 mm (17$^{3}/_{4}$ in). Thus it fitted snugly into the IL-28's standard bomb bay, which was 4.18 m (13 ft 8$^{5}/_{16}$ in) long and 0.95 m (3 ft 1$^{13}/_{32}$ in) wide, and the abovementioned modifications to the bay were probably concerned with the torpedo rack and associated wiring.

Before the attack the navigator set the torpedo's travel depth (2-8 m/6.5-26 ft, depending on the draught of the target ship), switched its capacitors to charge mode and began the attack run. At the proper moment the bomb sight automatically released the torpedo; one second later a small propeller-shaped stabilising parachute deployed and the RAT-52 descended vertically, dropping fast like a bomb. The main parachute deployed at 500 m (1,640 ft), reducing the descent speed. It separated after splashdown, whereupon a pair of foreplanes on the torpedo's extreme nose were brought into play to bring the RAT-52 from its maximum dive depth of 20 m (65 ft) to the preset depth and level it off. Next, the foreplanes were jettisoned, the solid-fuel rocket motor was ignited, delivering a thrust of 800-1,200 kgp (1,760-2,645 lbst), and the torpedo continued straight ahead on the course it had at the moment of release.

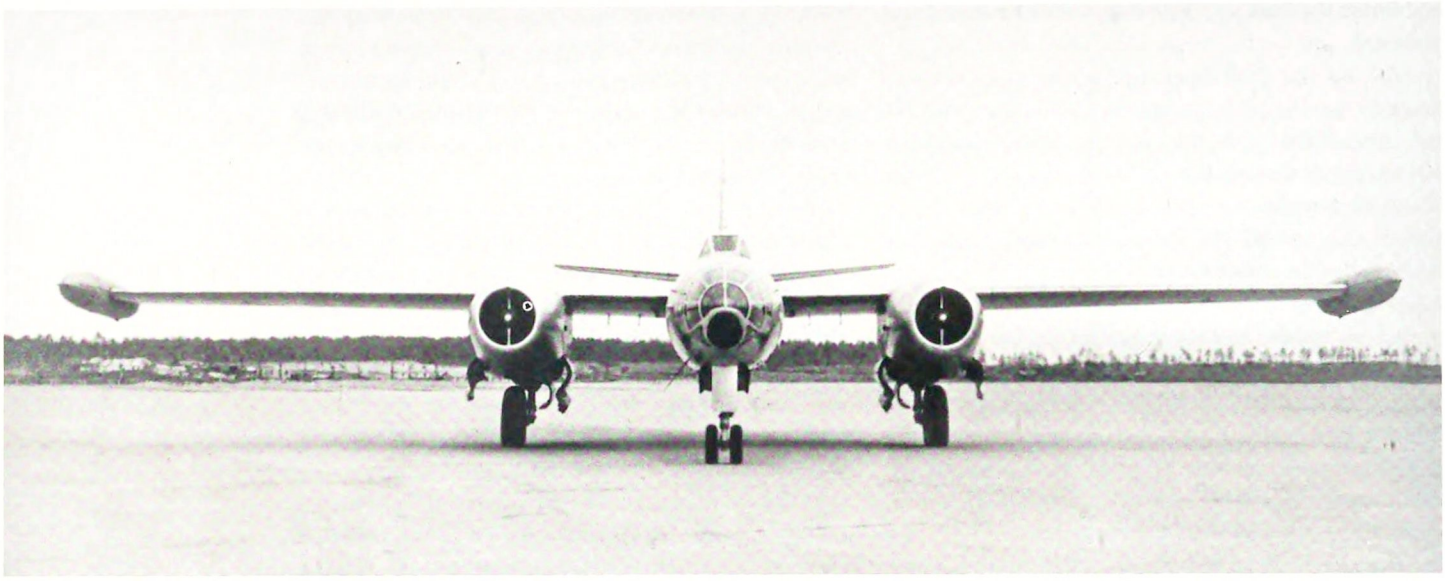
The rocket motor accelerated the torpedo to 58-68 kts (107-130 km/h); time from release at 2,000 m (6,560 ft) to impact was only 35 seconds, including 26 seconds for the aerial segment of the trajectory, which left the target no time for evasive action. By comparison, conventional torpedoes with steam turbines could not travel faster than 40-45 kts (74-83 km/h). The chief shortcoming of the torpedo was the rocket motor's short burn time (16-19 seconds) giving a range of only 550-600 m (1,800-1,970 ft), which took the bomber within range of the ship's air defences. On the other hand, the torpedo could be dropped at any altitude from 1,500 m upwards at a speed up to 800 km/h (496 mph). A 'kill' was possible if the torpedo splashed down in a rectangle with two sides equalling the torpedo's range and the other two equalling target length plus a small target lead. For a ship with a hull length of 100-120 m (330-390 ft), 'kill' probability in a single-torpedo attack was 17-23%, increasing in the event of a multiple-torpedo attack.

Restrictions on wave height applied during the attack. In choppy seas the RAT-52 could pop out of the water and turn into a 'flying fish', following a ballistic trajectory (as it was, to all intents and purposes, a rocket) and emitting an ear-splitting roar!

During trials held on the Black Sea in September-November 1952, Tu-14T torpedo-bombers and modified IL-28s successfully dropped a total of 54 RAT-52 torpedoes, using the OPB-6SR sight. The torpedo was officially included in the AVMF inventory on 4th February 1953. With one RAT-52 the modified IL-28T had a 18,400-kg (40,560-lb) take-off weight, attaining a top speed of 906 km/h (562 mph), a service ceiling of 12,500 m (41,010 ft) and a range of 2,400 km (1,490 miles).

However, the tests revealed some serious deficiencies. In particular, with one RAT-52 torpedo the IL-28 carried only about one-third of its design payload; moreover, older Soviet torpedoes were too long to be carried internally by the *Beagle*. To remedy this, at least one IL-28 was experimentally modified to feature a large ventral canoe fairing instead of the standard bomb bay doors; this was apparently a torpedo pannier permitting carriage of either two RAT-52s suspended above one another or, equally possibly, a long torpedo that did not fit into the standard bomb bay. The fairing aft of the cockpit canopy was lengthened considerably, terminating at fuselage frame 18 instead of frame 16, in order to incorporate a bay with a hinged cover for an LAS-5M inflatable rescue dinghy between the cockpit's rear bulkhead and the usual bay for the ADF loop aerial; this required the ADF components to be rearranged. No provision was made for tip tanks at this stage. The aircraft was either unserialled or the serial was retouched away by the military censor on the only known photo. Apparently this 'pot-bellied' version proved unsatisfactory and was not proceeded with.

Also, the Soviet Navy had large stocks of pre-war vintage 45-36MAN (i.e., 450 mm or 17$^{45}/_{64}$ in calibre, 1936 model, [*tor**ped**a] moderni**zee**rovannaya, aviatsi**on**naya, **niz**kovy**sot**naya* – updated aerial torpedo for low-altitude attacks) and 45-36ANU torpedoes ([*tor**ped**a] aviatsi**on**naya, **niz**kovy**sot**naya, oo**sil**ennaya* – aerial torpedo for low-altitude attacks, reinforced [body to prevent damage during splashdown]). The AVMF wished to use them on the IL-28, believing they offered better chances of a 'kill' in a low-altitude attack; however, it turned out that the jet bomber's speed was outside the operational limits of these torpedoes, which had been designed for slower propeller-driven aircraft.



Top and above: The first prototype of the 'long-bay' IL-28T torpedo-bomber (c/n 50301106) during manufacturer's tests. Note the tip tanks (which often caused it to be mistaken for the IL-28R prototype) and the angular cockpit windshield. The starboard nose cannon and the standard navigator's station glazing are retained for the time being.

A lengthy upgrade of the 45-36MAN torpedo ensued; the result was the 45-56NT torpedo (i.e., 450-mm calibre, 1956 model, ***niz****koye tor****ped****ome****tah****niye* – low-altitude torpedo attack). It featured a travel depth stabiliser and a stabilising parachute borrowed from the RAT-52; the torpedo was 5,000 mm (16 ft 4$^{5}\!/_{64}$ in) long, with a launch weight of 1,036 kg (2,284 lb) and a 200-kg (440-lb) warhead. The 45-56NT could be dropped at altitudes of 120-230 m (390-750 ft) and speeds up to 700 km/h (434 mph); it had a maximum range of 4 km (2.48 miles) and travelled at 36 kts (66.6 km/h). This was the last Soviet air-launched wet-heater torpedo. Documents from first-line units show that the 45-56NT did not find practical use.

IL-28T torpedo-bomber (first version)

Apparently the designers were aware of the shortcomings of the 'quick fix' torpedo-bomber conversion all along because development of a dedicated version designated IL-28T (*torpedo****nos****ets* – torpedo-bomber) also began in 1950. The mock-up review commission signed the act of acceptance on 7th July that year, allowing prototype conversion to begin

The aircraft was intended for high- and low-altitude torpedo attacks and minelaying. It differed from the first torpedo-bombers based on standard IL-28s primarily in having the weapons bay extended aft to increase its length to 6.66 m (from 13 ft 8$^{9}\!/_{16}$ in to 21 ft 10$^{13}\!/_{64}$ in) – or, according to some sources, 6.43 m (21 ft 1$^{1}\!/_{32}$ in), permitting internal carriage of 1936 model torpedoes. Also, the wings were moved aft 100 mm (3$^{15}\!/_{16}$ in) – apparently for CG reasons, with appropriate changes to the fuselage structure. Accordingly the landing gear wheelbase increased 100 mm – from 6.677 to 6.777 m (from 21 ft 10$^{13}\!/_{16}$ in to 22 ft 2$^{13}\!/_{16}$ in).

Top and above: The second prototype of the 'long-bay' IL-28T (c/n 50301104) at Moscow-Khodynka during manufacturer's tests. Here the non-standard canopy is augmented by an altered navigator's station glazing to facilitate low-level torpedo attacks. Note the undernose blister enclosing the PTN-45 torpedo-bombing sight.

The longer weapons bay and the stowage bay for an LAS-3 rescue dinghy required changes to the Nos. 2-5 fuel tanks, reducing internal fuel capacity drastically from 7,908 to 4,770 litres (from 1,739 to 1,269.4 Imp gal) and the fuel load from 6,600 to 5,080 kg (from 14,550 to 11,200 lb). To compensate for this the IL-28T had provisions for 950-litre (209 Imp gal) tip tanks borrowed from the IL-28R, each holding 750 kg (1,653 lb) of fuel; with tip tanks the total capacity increased to 6,670 litres (1,467.4 Imp gal) and the fuel load to 6,580 kg (14,510 lb). (Some sources quote the reduction in internal fuel capacity as 2,300 litres (506 Imp gal); this makes it 5,608 litres (1,233.76 Imp gal), or 7,508 litres (1,651.76 Imp gal) with tip tanks.)

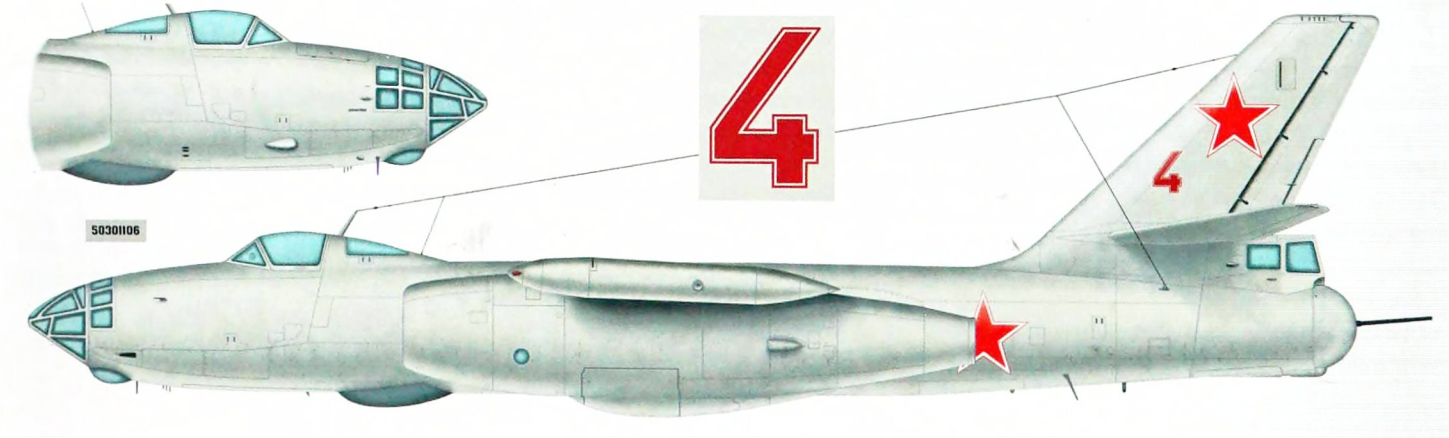
Despite the relocated wings, the aircraft's overall dimensions were identical to those of the IL-28R. The IL-28T could be configured as a conventional bomber with a bomb load equal to that of the standard *Beagle*.

The starboard forward-firing cannon and its ammunition box were deleted, as was the AFA-33/75 (or NAFA-MK) camera. Instead, two AFA-BA/400 vertical cameras and an AKS-1 cine camera were installed to record the strike results. Other new equipment items included a Magniy IFF interrogator, a PTN-45 low-altitude sight (*pri**tsel** tor**ped**nyy **niz**kovy**sot**nyy* – sight optimised for low-level torpedo attack) and a separate PP-1 high-altitude sight; the latter was also used for dropping anti-shipping mines. A Model 1010 electric heater was provided to defrost the PTN-45's sighting window. Some of the existing equipment items were relocated and additional armour protection was provided for the pilot and the navigator.

The normal ordnance load was 1,000 kg (2,204 lb), which permitted carriage of one torpedo of various models (45-36AVA, TAS, TAV, RAT-52 or A-2), or naval

Top: Now serialled '4 Red', the first prototype IL-28T is shown here at Feodosiya during state acceptance trials. The navigator's station glazing has been revised to match the second prototype.

Above: Another shot of the first prototype at Feodosiya. The absence of the starboard nose cannon is noteworthy here. The drawing below shows the aircraft in the same configuration.



mines – two 500-kg (1,102-lb) AMD-4-500 influence mines, or one AMD-4-1000, AMD-M, IGDM or Type A mine. If necessary, the IL-28T could carry up to 3,000 kg (6,610 lb) of weapons at the expense of a reduced fuel load and shorter range. In that case possible weapons configurations were two 45-36MAV torpedoes totalling 1,940 kg (4,280 lb), or one 1,500-kg (3,310-lb) TAS torpedo, or one 1,100-kg (2,425-lb) AMD-4-1000 mine, or four AMD-4-500 mines (totalling 2,000 kg/4,410 lb), or two 1,250-kg (2,755-lb) *Serpey* mines, or two 970-kg (2,140-lb) ***Lee**ra* (Lyre) mines, or two 750-kg (1,650-lb) Desna mines.

Specifications of the 'long-bay' IL-28T (c/ns 50301106 and 50301104)

	Manufacturer's estimates	Manufacturer's flight tests	State acceptance trials
Empty weight, kg (lb)	13,085 (28,850)	13,370 (29,475)	13,370 (29,475)
All-up weight, kg (lb):			
normal	18,400 (40,560)	18,760 (41,360) [1]	18,763 (41,364) [1]
maximum	21,330 (47,020)	21,620 (47,660) [1]	21,630 (47,685) [1]
Landing weight, kg (lb)	13,840 (30,511)	n.a.	n.a.
Fuel load, kg (lb):			
internal	3,600 (7,936)	3,800 (8,377)	3,800 (8,377)
with tip tanks	6,580 (14,506)	6,475 (14,274)	6,485 (14,296)
Payload, kg (lb):			
normal	5,315 (11,720)	5,390 (11,880)	5,390 (11,880)
maximum	8,245 (18,180)	8,250 (18,190)	8,260 (18,210)
Wing loading, kg/m² (lb/sq. ft)	308 (63.15)	308 (63.15)	308 (63.15)
Power loading at sea level, kg/kgp (lb/lbst)	3.4	3.48	3.48
Top speed (with tip tanks), km/h (mph):			
at 1,000 m (3,280 ft)	n.a.	802 (498)	785/800 (487/496) [2]
at 5,000 m (16,400 ft)	n.a.	874 (542)	827/877 (513/544) [2]
at 10,000 m (32,810 ft)	n.a.	836 (519)	802/840 (498/521) [2]
Landing speed, km/h (mph)	n.a.	n.a.	178 (110)
Rate of climb, m/sec (ft/min):			
at sea level	n.a.	13.4 (2,637)	14.7 (2,893)
at 5,000 m	n.a.	7.8 (1,535)	9.05 (1.781)
at 10,000 m	n.a.	2.3 (452)	3.3 (649)
Climb time, minutes:			
to 5,000 m	n.a.	8.0	7.1
to 10,000 m	n.a.	26.4	21.4
Service ceiling, m (ft)	n.a.	11,500 (37,730)	11,950 (39,210)
Range with tip tanks and one 45-36MAV torpedo, km (miles)	2,200 (1,366) [3]	1,644/2,221 (1,021/1,379) [4]	2,149 (1,334) [5]
Endurance with tip tanks and one 45-36MAV torpedo	n.a.	3 hr 03 min/3 hr 33 min [4]	3 hr 29 min/3 hr 41.5 min [9]
Take-off run, m (ft):			
unassisted (normal/maximum TOW)	n.a.	875/1,450 (2,870/4,760) [6]	950/1,395 (3,130/4,580) [6]
with PSR-1500-15 JATO boosters	n.a.	770 (2,530) [7]	1,020 (3,350) [7]
Take-off distance to h=25 m (82 ft), m (ft):			
unassisted (normal/maximum TOW)	n.a.	1,570/2,460 (5,151/8,070) [6]	2,000/2,630 (6,561/8,628) [6]
with PSR-1500-15 JATO boosters	n.a.	1,300 (4,265) [7]	2,410 (7,906) [7]
Landing run, m (ft)	n.a.	n.a.	940 (3,084) [8]
Landing distance from h=25 m, m (ft)	n.a.	n.a.	2,125 (6,971) [8]

Notes:
1. With one 45-36MAV torpedo
2. Engine speed (N) 11,200 rpm and 11,560 rpm respectively
3. With a 1,000-kg (2,204-lb) weapons load at 10,000-12,700 m (32,810-41,670 ft)
4. At 5,000 m and 543 km/h (337 mph) or 10,000 m and 645 km/h (400 mph) respectively
5. At 10,000 m and 652 km/h (405 mph) with a 21,632-kg (47,689-lb) all-up weight
6. With a 18,760-kg (41,360-lb) normal AUW and a 21,620-kg (47,660-lb) maximum AUW
7. With a 22,100-kg (48,720-lb) take-off weight
8. With a 15,000-kg (33,070-lb) landing weight
9. At 10,000 m and 652/569 km/h (405/353 mph) respectively with a 21,632-kg (47,689-lb) AUW

The IL-28T's weapons options in torpedo attack configuration				
Torpedo type	**45-36AM**	**TAS**	**A-2**	**45-36MAV**
Quantity	1	1	1	2
Ordnance weight, kg (lb)	1,043 (2,299)	1,533 (3,379)	615 (1,355)	2,128 (4,691)
Fuel load, kg (lb)	6,485 (14,296)	6,485 (14,296)	6,485 (14,296)	5,550 (12,235)
Take-off weight, kg (lb)	21,600 (47,619)	22,090 (48,699)	21,063 (46,435)	21,635 (47,696)

The IL-28T's weapons options in mine-laying configuration						
Mine type	**AMD-4-500**	**AMD-4-1000**	**Leera**	**Serpey**	**Desna** *	**IGDM**
Quantity	2/4	1	1/2	1/2	1/2	1
Ordnance weight, kg (lb)	1,018/2,018 (2,244/4,448)	1,018 (2,244)	988/1,958 (2,178/4,316)	1,268/2,518 (2,795/5,551)	768/1,518 (1,693/3,346)	1,268 (2,794)
Fuel load, kg (lb)	6,485/5,550 (14,300/12,235)	6,485 (14,296)	6,485/5,700 (14,300/12,570)	6,485/4,800 (14,300/10,582)	6,485/6,150 (14,300/13,560)	6,485 (14,296)
Take-off weight, kg (lb)	21,575/21,640 (47,564/47,710)	21,575 (47,564)	21,545/21,616 (47,500/47,654)	21,825/21,094 (48,115/46,503)	21,325/21,626 (47,012/47,676)	21,825 (48,115)

* on a BD-4 rack

(Note: AMD = *aviatsi**on**naya **mee**na **don**naya* – air-dropped bottom mine; IGDM = *indooktsi**on**no-**ghid**rodina**mich**eskaya **don**naya **mee**na* – bottom mine with a combined induction/hydrodynamic detector. Desna is the name of a river in European Russia. As for the nonsensical word Serpey, it is nothing more than an accidental anagram of the intended codename *Per**sey*** (Perseus). Quite simply, a typist had made an error when typing out the document clearing the weapon for service, and no-one had taken the responsibility to set her straight, believing that 'the Powers That Be know better'!)

The first prototype IL-28T was converted in 1950 from an early-production Moscow-built bomber (c/n 50301106), making its first flight on 8th (some sources say 9th) January 1951 with Vladimir K. Kokkinaki at the controls; N. D. Sorokin was the flight engineer and A. P. Vinogradov was the engineer in charge of the flight tests. Originally (at the manufacturer's flight test phase) the as-yet unserialled aircraft retained both the standard navigator's station glazing (apparently the PTN-45 sight was not yet fitted) and the starboard forward-firing cannon. The most visible external change was the angular cockpit windshield with a rectangular windscreen and optically flat sidelights reminiscent of that fitted to the first prototype IL-28 *sans suffixe* – apparently to improve the view during low-level attacks.

Even as the first prototype IL-28T was undergoing manufacturer's flight tests it ran into opposition in high places. As early as 20th January 1951, War Minister Marshal Aleksandr M. Vasilevskiy, Minister of the Navy Adm. Ivan S. Yumashev, Minister of Aircraft Industry Mikhail V. Khroonichev and Air Force C-in-C Air Marshal Pavel F. Zhigarev filed a joint report to the CofM Presidium's Bureau of Machinery Industries, stating that *'...the Tu-14 is currently the sole modern high-speed bomber capable of carrying naval mines and torpedoes'* – ignoring the IL-28T completely. The words of the report fell on sympathetic ears, and the Tu-14 was approved for production as a torpedo-bomber. Seemingly the *Beagle* stood no chances in this situation, yet General Designer Sergey V. Ilyushin did not give up. He was soon proven right: Tupolev and the MAP top brass had been overly optimistic about the Tu-14T; the state acceptance trials of the *Bosun* proved to be protracted and the first production machines were not delivered to the Navy until May 1951.

The second prototype IL-28T with the long weapons bay was likewise converted from an early Moscow-built *Beagle* (c/n 50301104). It was completed on 16th February 1951 and joined the programme on 12th March, making its maiden flight from Khodynka that day – again at the hands of Vladimir K. Kokkinaki. Unlike the first prototype, the navigator's station glazing framework was altered considerably to improve visibility during low-level flight over water and a small Perspex blister was added under the nose to accommodate the lens of the PTN-45 sight. The starboard nose cannon was deleted and the cannon port faired over, and two rod aerials were mounted under the outer wings. The tip tanks were not fitted – at least initially. In this guise the (likewise unserialled) aircraft joined the manufacturer's test programme, which was completed on 17th April 1951; Sergey V. Ilyushin endorsed the test report six days later.

The first prototype had the extreme nose modified in the same fashion (including removal of the starboard cannon) and gained the serial '4 Red' by the time the IL-28T was submitted to NII-15 (the Soviet Navy's counterpart of GK NII VVS) for state acceptance trials. These were held at Feodosiya on the Crimea Peninsula, proceeding from 7th June to 25th July 1951, and also went successfully. For this achievement a group of OKB-240 employees was again nominated for the Stalin Prize. (Some sources state the trials continued all the

way to December 1951 and that the trials report was endorsed by Naval Aviation C-in-C Col.-Gen. Yevgeniy N. Preobrazhenskiy on 21st November, recommending the aircraft for production.)

As early as August 1951 a complete set of manufacturing documents was transferred to one of the production factories; yet, despite being recommended for production and service with the AVMF, the 'long-bay' IL-28T never did enter production (despite claims to the contrary). The reason was the protracted development of the 45-56NT torpedo and the aircraft's inability to carry two RAT-52 torpedoes internally.

IL-28T torpedo-bomber (second version)

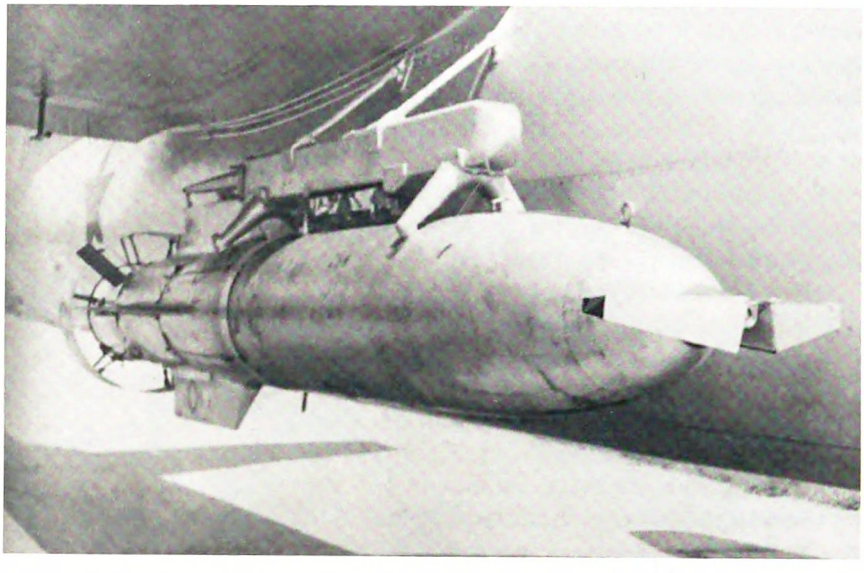
In 1954 the improved 45-54VT torpedo with a VT-2 parachute system (i.e., 450-mm calibre, 1954 model, *vy**sot**noye tor**ped**ome**tah**niye* – high-altitude torpedo attack) was included into the Soviet Navy arsenal, followed by the aforementioned 45-56NT low-altitude torpedo two years later. Both types were carried by the Tu-14T along with the RAT-52. In order to standardise the armament carried by Soviet torpedo-bombers and increase their punch it was decided to upgrade the IL-28s then in service with the AVMF.

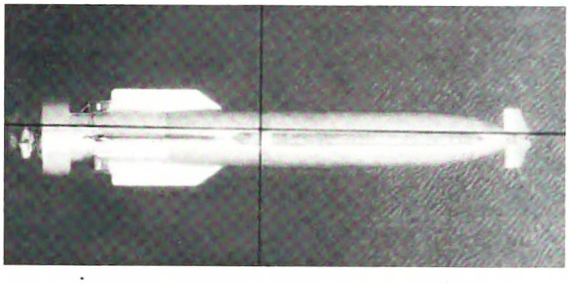
Hence a standard Voronezh-built IL-28 coded '22 Blue' (c/n 4404148) was converted into a torpedo-bomber armed with various types of torpedoes. As already mentioned, all of them except the RAT-52 were too long to be carried internally by the standard IL-28. An extensive conversion involving lengthening the bomb bay (and all the other changes this entailed) was considered inexpedient, so the designers opted for carrying the torpedoes externally. To this end fuselage frames 21 and 23 were reinforced to permit installation of two BD-4T torpedo racks (***bah**lochnyy der**zhah**tel' tor**ped**nyy* – beam-type [weapons] rack, for torpedoes) on the centre fuselage sides, and appropriate wiring and piping was installed. Each rack was attached by two horizontal struts and had two diagonal braces at the top, featuring a shackle and two pairs of sway braces. The aircraft was thus able to carry up to three RAT-52s (one internally and two externally) or two torpedoes of older models. In the former case the BD-4T racks were fitted with inverted-U shaped guides attached by struts to the fuselage sides to ensure correct separation of the torpedoes. In the case of the longer 45-36MAN and 45-54VT torpedoes, additional guides were mounted on the fuselage sides in line with the torpedoes' front ends. alternatively, two AMD-4-500 mines could be carried externally. The weapons were dropped at altitudes of 40-400 m (130-1,310 ft) and speeds of 360-800 km/h (223-496 mph).

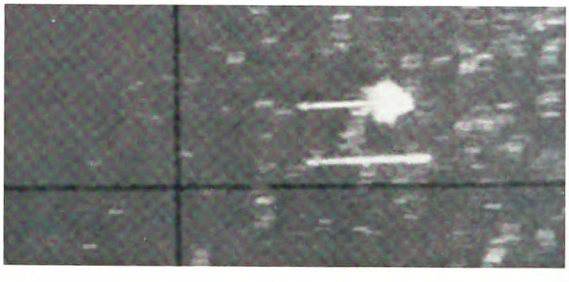
The aircraft was fitted with the new PTN-55 Som (Catfish) low-altitude torpedo-bombing sight, albeit incomplete, which was concurrently being tested on a modified Tu-14T. It allowed the navigator to programme the torpedo to move in a zigzag (this feature was believed to increase kill probability but demanded a substantial increase in the torpedo's range) and feed target data into the torpedo's control module up to the moment of release. The new sight again required the navigator's station glazing to be modified. This time there was no undernose Perspex blister, but a small optically flat elliptical pane was added above the standard large optically flat elliptical pane, sloping aft and giving the nose a more pointed profile; this new pane was to the collimator optical rangefinder of the Som sight. The control panel and other modules of the PTN-55 were installed on both sides of the navigator's station. As in the case of the torpedo-bomber conversion described above, the fairing aft of the cockpit canopy was extended aft to fuselage frame 18 to house an LAS-5M rescue dinghy; the canopy itself was standard. The modifications added 490-540 kg (1,080-1,190 lb) to the aircraft's empty weight.

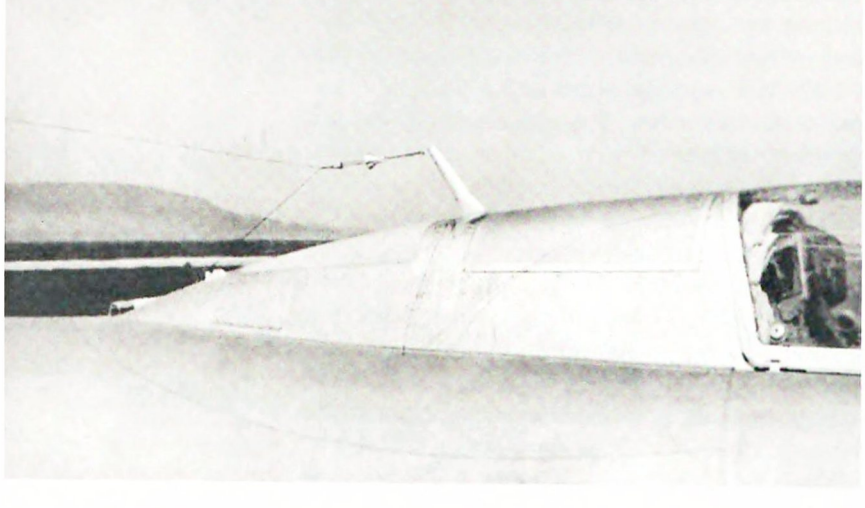
IL-28 '22 Blue', which was again designated IL-28T, underwent tests in 1955 at the NII-15 facility at Karagoz, another airfield in the Crimea. The aircraft was flown by project test pilot Maj. Igor' V. Yesakov and navigator Ozyorin, with S. Kh. Kabirov as engineer in charge. It turned out that standard production RAT-52s carried externally could be dropped at indicated airspeeds up to 500 km/h (310 mph) in a torpedo attack from 1,500-8,400 m (4,920-27,560 ft), or at higher speeds above the latter altitude; the upgraded RAT-52M (*modifi**tsee**rovannaya* – modified), which was being tested concurrently by NII-15, could be dropped throughout the IL-28T's speed envelope at altitudes above 1,500 m. Production 45-54VT torpedoes cold be dropped at any speed from altitudes above 750 m (2,460 ft), while 45-36MAN torpedoes could be dropped from 80-100 m (260-330 ft) at speeds not less than 380 km/h (236 mph).

However, the Navy was dissatisfied with the IL-28T. The high-drag external stores impaired the aircraft's performance and imposed restrictions on piloting techniques. Range was reduced by 400 km (248 miles) and service ceiling by 1,850 m (6,070 ft); at 5,000 m (16,400 ft) the aircraft was 107 km/h (66.5 mph) slower and took 2.4 minutes longer to reach this altitude. Rotation on take-off with external stores became difficult; the take-off run was increased, and so was the landing speed. At altitudes above 9,000 m (29,530 ft) the aircraft experienced vibration at high speed caused almost certainly by the turbulence generated by the BD-4T racks; tailplane buffet was commonly encountered in a shallow dive when two torpedoes were carried externally. Worse, if one torpedo was carried it generated so much asymmetric drag as to render turns in the opposite direction impossible. Besides, the 45-54VT and 45-36MAN torpedoes were









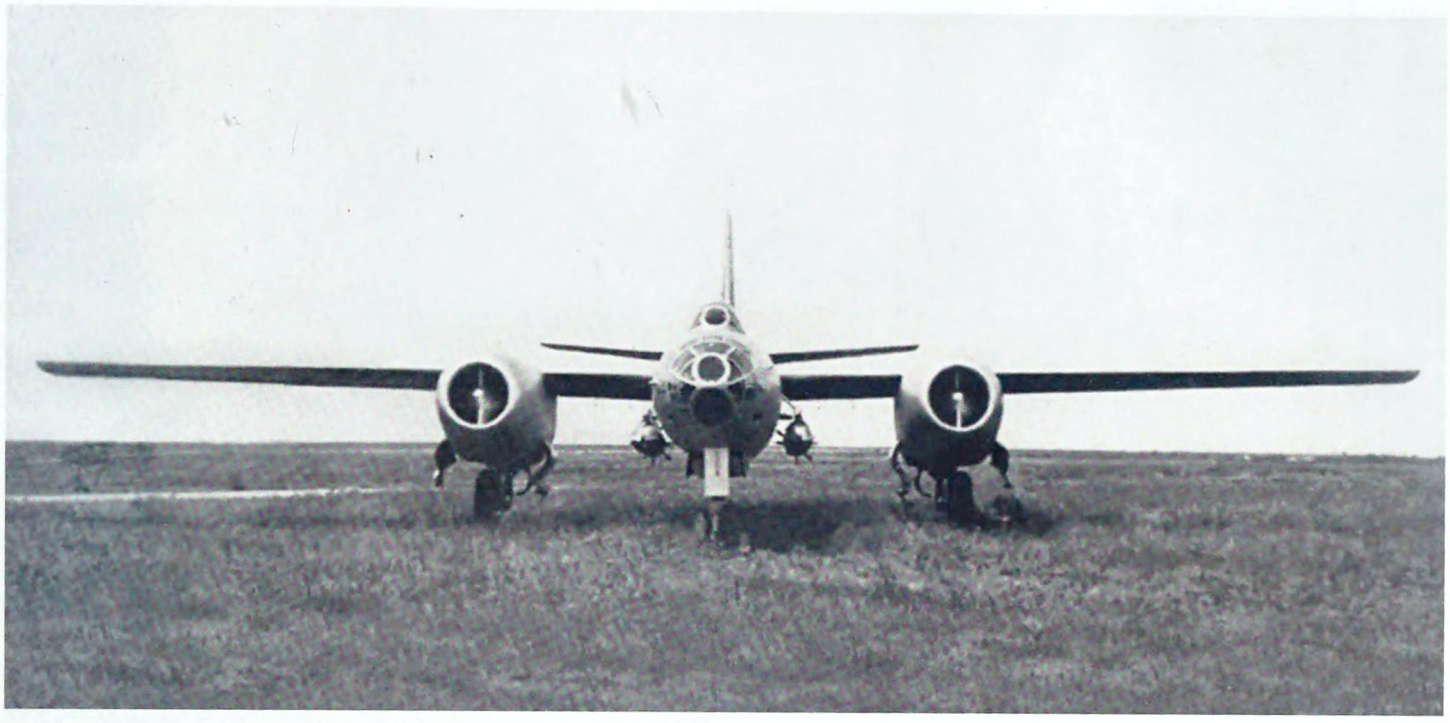
Top: IL-28T '22 Blue' (c/n 4404148) was a one-off machine able to carry three torpedoes – two externally and one internally. Note the modified nose glazing to take the PTN-55 Som torpedo-bombing sight.

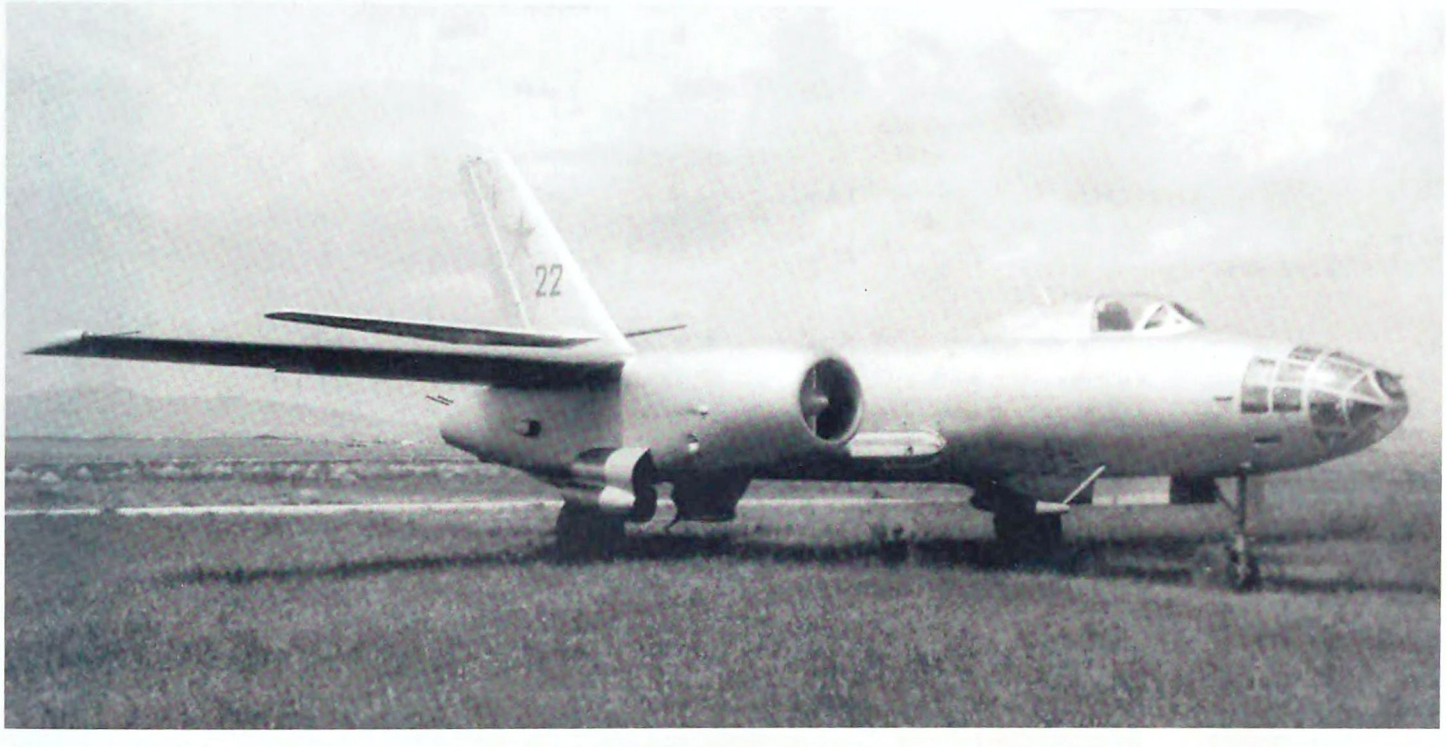
Above left: The starboard BD-4T rack with an RAT-52 torpedo attached.

Above centre: An RAT-52 torpedo is filmed as it falls away from IL-28T '22 Blue', showing the cruciform fins, the annular water rudder and the distinctive foreplanes.

Above: A salvo launch of two 45-36MAN torpedoes.

Left: IL-28T '22 Blue' had an extended fairing aft of the cockpit with stowage for an LAS-5M dinghy.





'seasonal' – they could only be used at ambient temperatures above 0°C (32°F); it turned out that some of their mechanisms simply froze up and refused to work at below-zero temperatures!

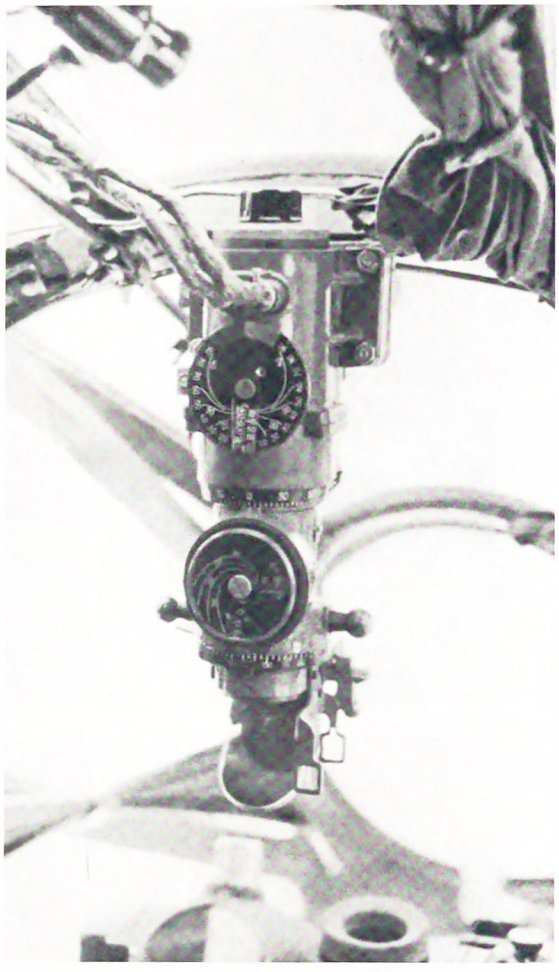
Finally, the IL-28 no longer met the Soviet Navy's demands and the torpedo-bomber force was re-equipping with the more modern Tu-16T *Badger-A*. Thus, IL-28 c/n 4404148 remained a one-off; on the other hand, the PTN-55 sight did find its way into service.

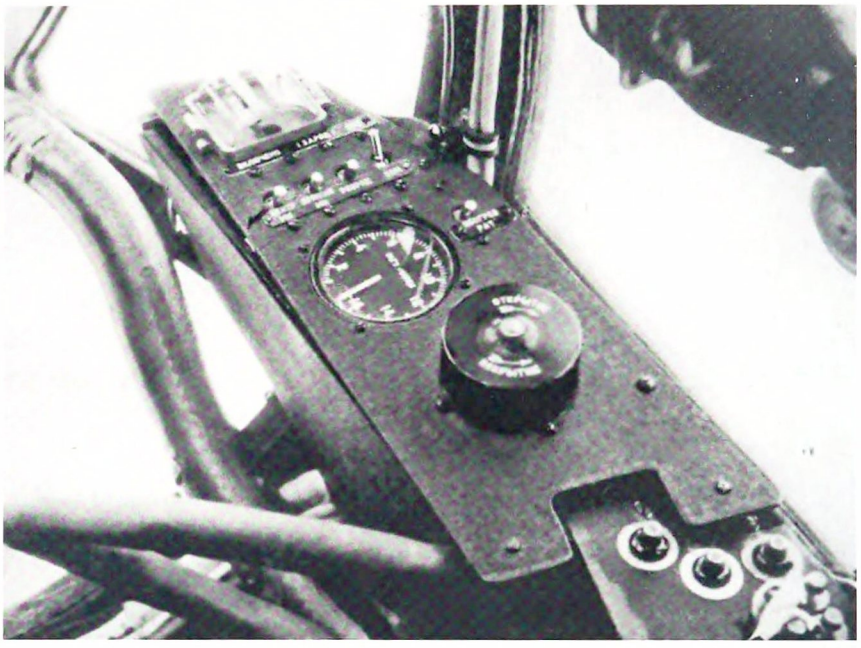
IL-28T torpedo-bomber (third version, IL-28T-2)

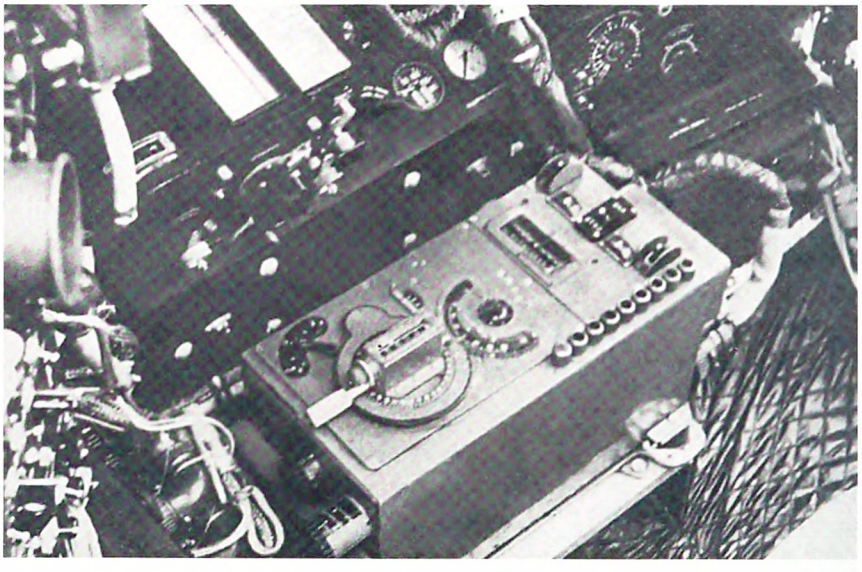
That said, the designation IL-28T was most often used for in-service aircraft which were adapted to carry one RAT-52 or RAT-52M internally pursuant to a Council of Ministers directive dated 24th January 1953. Such aircraft were outwardly identical to the standard IL-28 bomber – the nose glazing and cockpit canopy fairing were unchanged. The LAS-3 rescue dinghy was housed in the bomb bay.

Top: IL-28T '22 Blue' at Karagoz airfield with two RAT-52 torpedoes on the external racks during state acceptance trials in 1955.

Above: Here the same aircraft is seen at the same location carrying two 45-36MAN torpedoes externally.



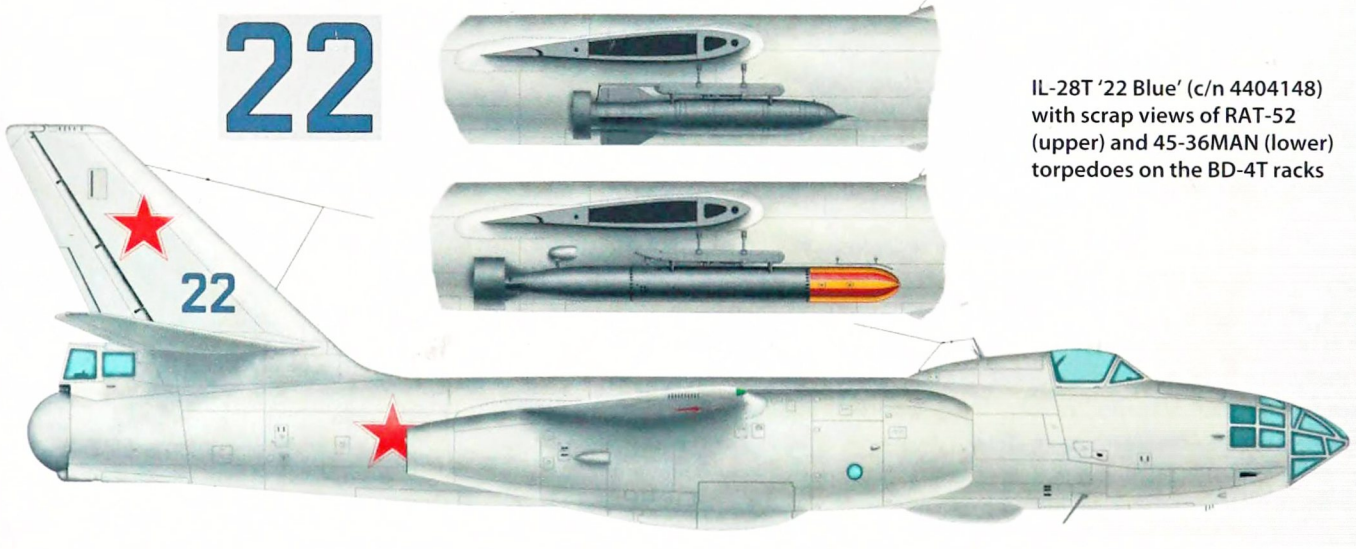




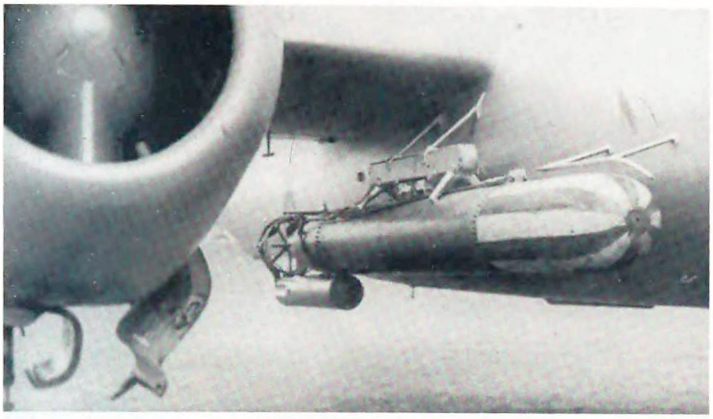
Above: The collimator rangefinder of the PTN-55 sight on IL-28T '22 Blue'.

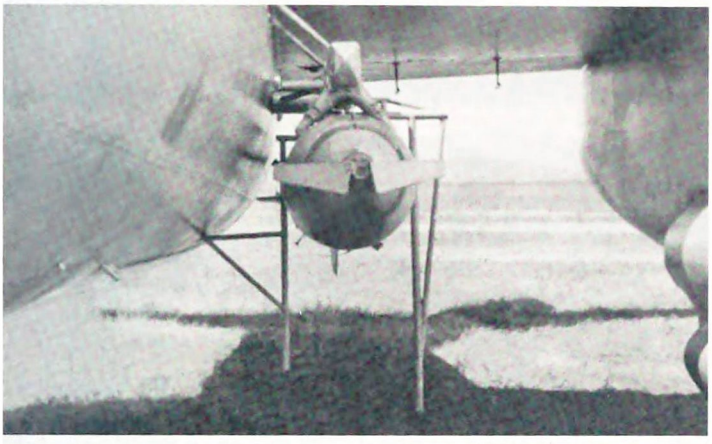
Above right: The PTN-55 control panel on the starboard side of the navigator's station.

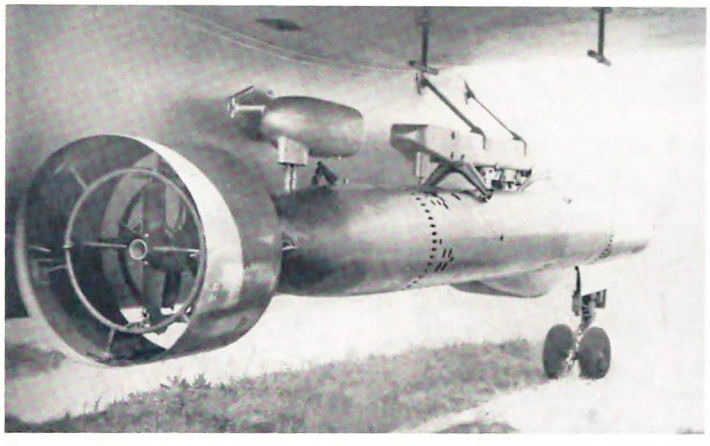
Right: The command module of the PTN-55 sight in the navigator's station; it initiated automatic torpedo release at the right moment.



IL-28T '22 Blue' (c/n 4404148) with scrap views of RAT-52 (upper) and 45-36MAN (lower) torpedoes on the BD-4T racks



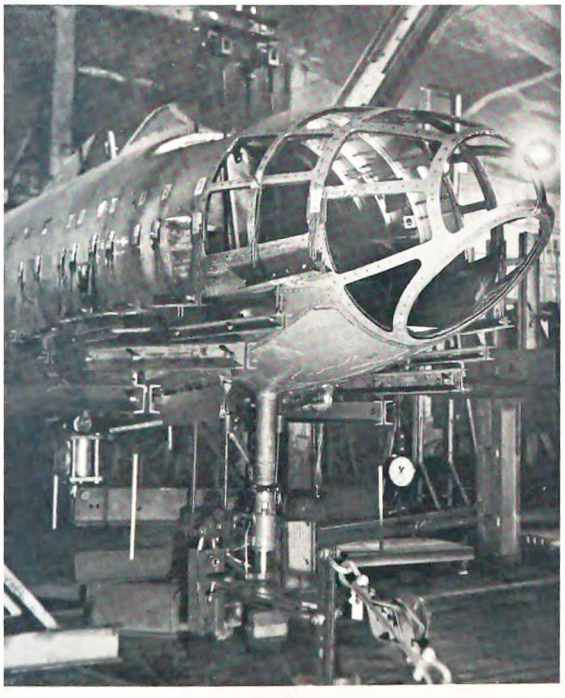


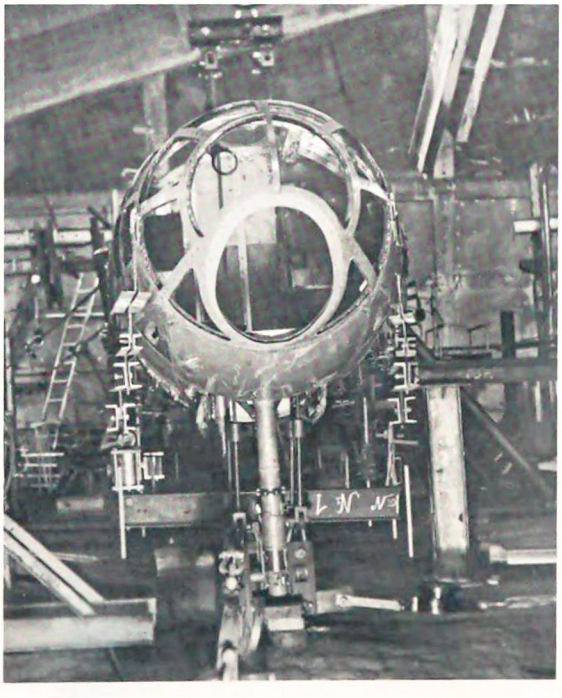


Some documents call such aircraft IL-28T-2. In particular, this designation was used with respect to a torpedo-bomber converted from an early-production Omsk-built IL-28 (c/n 0316601) which was retired early and tested to destruction in 1951 during repeat static tests to determine the *Beagle*'s fatigue life.

IL-28N (IL-28A) nuclear-capable bomber

The Soviet military doctrine of the early 1950s demanded that the Tactical Aviation branch of the Soviet Air Force was to have nuclear capability. Several types of tactical nuclear weapons were under development at the time by the KB-11 design bureau of



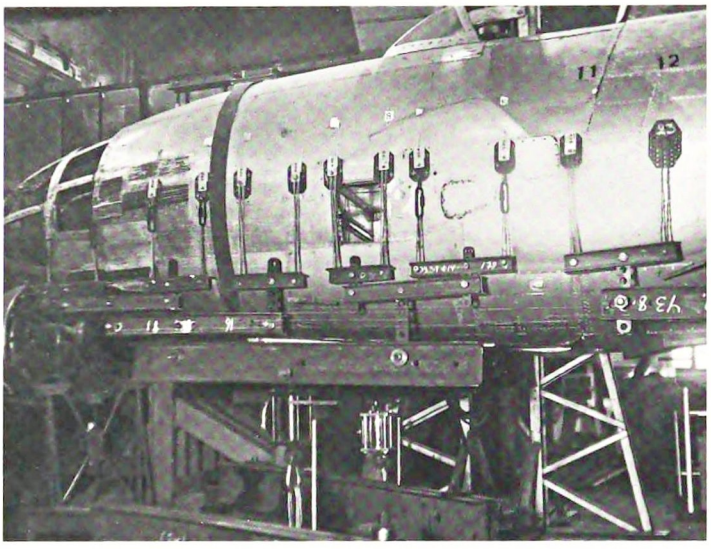


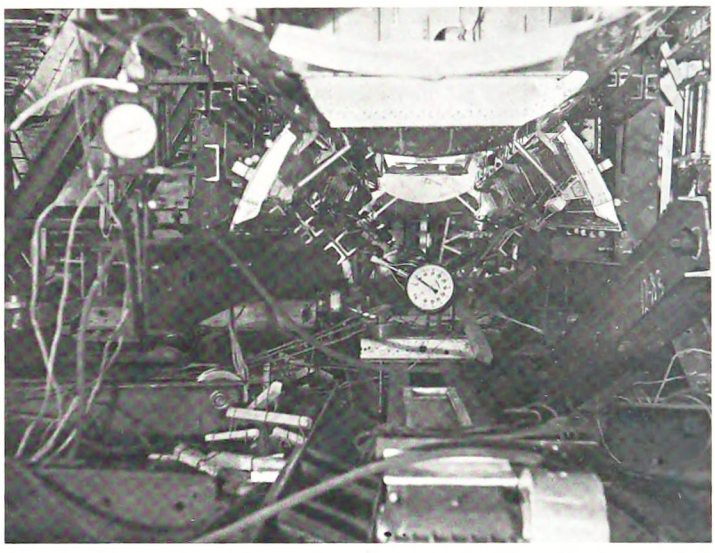
Top and top left: Two 45-54VT torpedoes with parachute system canisters on the racks of IL-28T '22 Blue'.

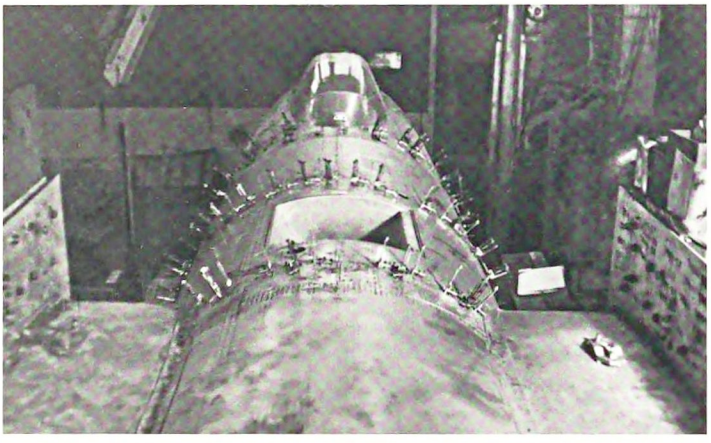
Above left: Here, the RAT-52 torpedo suspended on the port rack is provided with guides assisting separation.

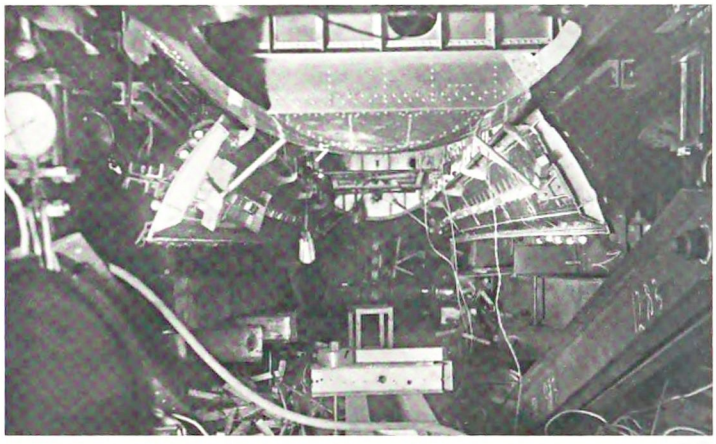
Above: A 45-36MAN torpedo on the starboard rack of the same aircraft. Note the additional fixture at the rear.

Left and far left: This Omsk-built torpedo-bomber (c/n 0316601) referred to in the test report as IL-28T-2 was withdrawn from service and tested to destruction during static tests in 1951.









Top: The forward fuselage of IL-28T-2 c/n 0316601; note the frame numbers painted on.

Above: This view shows the location of the rescue dinghy bay on in-service torpedo-bombers.

Top right and above right: The bomb bay of the same aircraft; note the cut-out for the radar antenna ahead of the bay.

The vertical tail of the same IL-28T-2 after failing under a lateral load.

the Soviet Academy of Sciences' Laboratory No.2 in the town of Sarov (Gor'kiy Region) under the direction of Academician Yuliy B. Khariton. These included the RDS-4 *Tat'**ya**na* (8U69 or *izdeliye* 244N) implosion-type bomb with a yield of 30 kilotons – the first Soviet mass-produced weapon of the kind. The RDS acronym was used for early Soviet nuclear devices from the RDS-1 of 1949 onwards, generating such explanations as *re'ak**tiv**nyy **dvig**atel' spetsi**ahl'**nyy* ('special reaction engine' or 'special jet engine'), *re'ak**tiv**nyy **dvig**atel' Stalina* ('Stalin's jet engine'), *Ros**see**ya **del**ayet sa**ma*** ('Russia makes [the atomic bomb] on her own') etc. As for the name Tat'yana, it was then customary to use Russian women's names as codenames for nuclear bombs.

Accordingly the Soviet government issued a directive demanding the development of new tactical bombers capable of delivering them. However, this would clearly be a time-consuming process, so it was decided to modify existing aircraft in service with the VVS, including the IL-28, for the nuclear strike role.

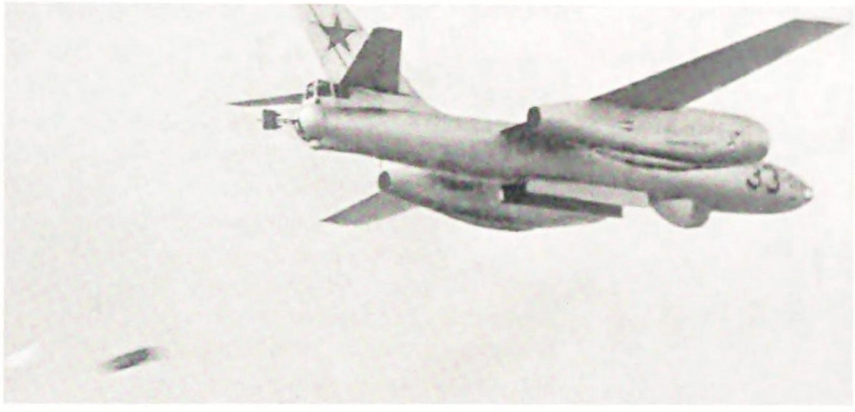
First, two IL-28s were specially modified by OKB-30 (the design bureau of MMZ No.30) for testing the RDS-4 according to the specifications issued by KB-11. Among

other things, the bomb bay was thermally insulated and equipped with electric heating to maintain the bomb at the correct temperature (a cold soak at high altitude could cause it to malfunction, leading to non-detonation). Special equipment was fitted to monitor the bomb's systems status, as was test equipment to measure the parameters of the explosion, including sensors measuring the effect of the blast wave and light radiation on the airframe, and cine cameras capturing the development of the famous mushroom cloud.

The first drop of an RDS-4 from the IL-28 at the Semipalatinsk Proving Ground in Kazakhstan took place on 23rd August 1953. (Some sources claim that the bomb was in so-called check configuration on that occasion – that is, with a conventional high-explosive charge and data link sensors.) The aircraft was flown by pilot V. I. Shapovalov, navigator/bomb-aimer A. V. Koz'minykh and GRO B. S. Soodakov. The 1,200-kg (2,645-lb) bomb was dropped at 11,000 m (36,090 ft), detonating successfully at the preset altitude of 600 m (1,970 ft). Four RDS-4 bombs were dropped, with a day's interval in each case, between 29th September and 5th October 1954. All in all the test programme involved more than 50 flights, 15 of which were weapon drops; the safety of landing with an unused bomb was checked, among other things.

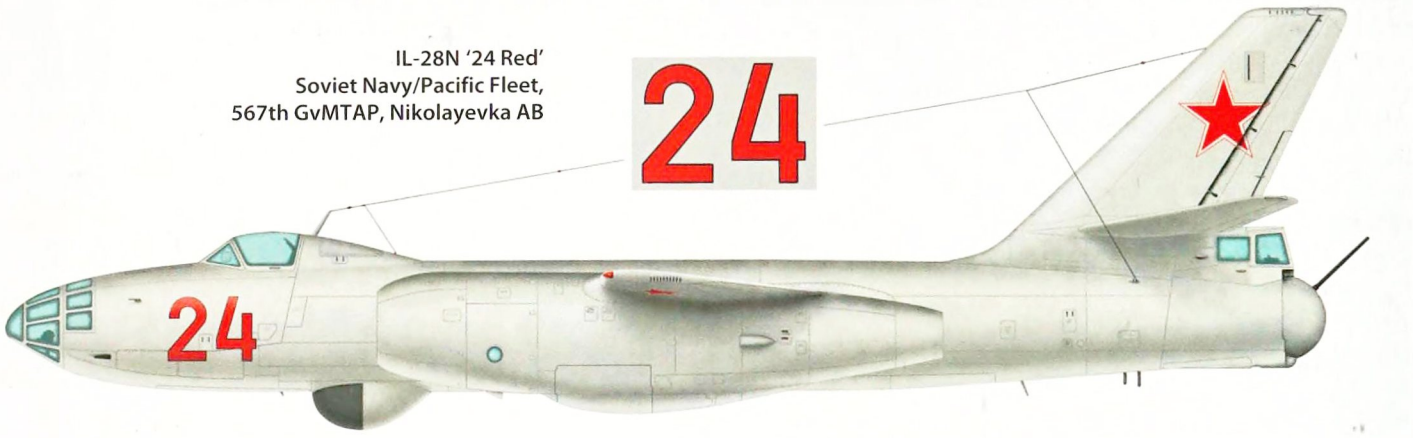
After the successful completion of the trials the RDS-4 entered production. So did the nuclear-capable version of the *Beagle* which was designated IL-28N (*no**sit**el'* [***spets**boyepri**pah**sa*] – carrier of 'special', that is, nuclear munitions). This version is often referred to as IL-28A (***ah**tomnyy* – 'atomic', i.e., nuclear-capable); however, this designation is strictly unofficial.

Apart from the changes to the bomb bay, the IL-28N differed from the standard bomber in having an updated avionics suite. The PSBN-M radar was replaced by an RBP-3 navigation/attack radar (***rah**diolokat-si**on**nyy bombardi**rov**ochnyy pri**tsel*** – radar bomb sight; NATO codename *Look Two*) in a much deeper radome which was the IL-28N's identification feature. It was similar in shape and size to that of the Koors radar fitted to some IL-28Rs but only the front half was dielectric, the



Top and above: This aircraft, which was used for test-dropping P-121 paradroppable bags for weapons and other materiel (note the cine cameras attached to the tail guns), was referred to as an 'IL-28T with a Koors radar'. In fact, it is an IL-28N nuclear-capable bomber – apparently from an AVMF unit!

Navigator Boris I. Stookov beside his mount, IL-28N '24 Red' (c/n 55006728) of the Pacific Fleet's 567th GvMTAP, at the unit's home base (Nikolayevka AB). He was killed in the crash of this aircraft on 28th August 1959.



rear half being a metal fairing. Also, IL-28Rs with the Koors radar had tip tanks, which the bomber lacked.

The RBP-3 was developed by the Kiev-based OKB-483 design bureau in the MAP framework in 1952-54; the design effort was led by V. P. Ostrovskiy. The radar could detect a large area target (such as a city) at up to 100 km (62 miles), a large surface ship at up to 50 km (31 miles) and a large river at up to 40 km (24.85 miles). It indicated headings, the distance to ground waypoints, the altitude above such waypoints, the ground speed and allowed the navigator to determine the aircraft's position, using identified landmarks; target range was determined at up to 30 km (18.6 miles) with an error margin of ±100 m (330 ft). The RBP-3 was designed to work in 360° scan mode or scan a 60°, 90° or 120° sector, operating in conjunction with the OPB-6SR optical bomb sight. The radar passed its state acceptance trials successfully in 1954.

Other changes to the avionics and equipment were an RSIU-5V Doob-5 (Oak; later redesignated R-802V) UHF command radio replacing the standard RSIU-3M, a US-8 receiver instead of the usual US-P, an RV-18 high-altitude radio altimeter replacing the standard RV-10. The electric system was modified to include PO-3000 (main) and PO-3000A (back-up) single-phase AC converters. Last but not least, the cockpits featured shutters protecting the crew from the flash of the nuclear explosion.

The IL-28N's empty weight increased to 13,040 kg (28,750 lb) – 150 kg (330 lb) higher than the standard bomber's; accordingly the TOW was also 150 kg higher at 18,550 kg (40,895 lb). The changes also caused an aft shift of the CG (with maximum fuel it was at 22.7% MAC instead of 21.6% MAC on the IL-28 *sans suffixe*), but this had virtually no effect on the aircraft's handling and performance.

IL-28S tactical bomber (project)

In 1949-50 OKB-240 sought ways of further improving the design of the basic IL-28. The main objective was to increase the bomber's speed and range. This was to be achieved by mating the existing fuselage and tail surfaces with all-new wings swept back 35° at quarter-chord. The resulting aircraft was designated IL-28S (*strelo**vid**noye kry**lo*** – swept wings).

Two versions were envisaged, differing in engine type – one was powered by standard VK-1As while the other had more powerful and fuel-efficient Klimov VK-5 centrifugal-flow turbojets. The VK-5 was a derivative of the VK-1A uprated to 3,100 kgp (6,830 lbst) for take-off and 2,760 kgp (6,080 lbst) for cruise, differing mainly in having a more efficient compressor; the engine's dry weight and overall dimensions remained unchanged. This undoubted achievement was made possible by the use of new heat-resistant alloys, a higher turbine temperature and more efficient cooling. Specific fuel consumption (SFC) was 6% lower as compared to the production VK-1A.

According to the PD project documents, the IL-28S was to have a maximum take-off weight of 23,930 kg (52,760 lb), a fuel load of 7,000 kg (15,430 lb), a normal bomb load of 1,000 kg (2,205 lb) and a maximum bomb load of 2,000 kg (4,410 lb). Speed at 4,500 m (17,760 ft) was estimated as 915-925 km/h (568-574 mph); range with a normal bomb load was to be 2,400 km (1,491 miles) and the service ceiling at least 12,300 m (40,350 ft). The take-off run varied from 1,570 to 1,700 m (5,150-5,580 ft).

However, preliminary design studies showed that the IL-28S offered no tangible advantages over the production *Beagle*. Moreover, the incorporation of new wings would incur major technological problems. Hence development of the swept-wing version was abandoned – a decision proven correct by the chief competitor's negative experience. The Tupolev OKB achieved scant success with the 'aircraft 82' (Tu-82) tactical bomber prototype powered by two VK-1s – the first Soviet swept-wing jet bomber which first flew in March 1949 (and, incidentally, closely resembled the would-be IL-28S).

IL-28RM tactical reconnaissance aircraft prototype

Meanwhile, the Ilyushin OKB attempted to introduce the new VK-5 powerplant on production versions of the straight-wing IL-28. Several government directives and MAP orders were issued, envisaging the installation of VK-5s on all three principal versions of the *Beagle* – ordinary bomber, torpedo-bomber and reconnaissance aircraft.

The latter version received the highest priority, since the VVS was pretty desperate to extend the reach of its tactical reconnaissance aircraft. The PHOTINT aircraft then under development at the Mikoyan (OKB-155) and Yakovlev (OKB-115) design bureaux were *a priori* handicapped by inadequate range, being derived from tactical fighters; conversely, the IL-28R and 'aircraft 78' (Tu-78, the PHOTINT version of the Tu-14) were based on bombers designed to have much longer range. Installing more fuel-efficient engines would allow the IL-28R to meet the performance target requested by the military – a range of 3,250 km (2,020 miles) and a service ceiling of at least 13,000 m (42,650 ft); these were to be increased later to 4,000 km (2,490 miles) and 13,500-14,000 m (44,290-45,930 ft).

On 3rd August 1951 the Council of Ministers issued directive No.2817-1388ss ordering the development of the IL-28RM ([*samo**lyot***-] *raz**ved**chik, modifi**tsee**-rovannyy* – reconnaissance aircraft, modified) powered by VK-5 engines. The aircraft was to be submitted for state acceptance trials not later than March 1952 – a tight schedule which proved impossible to maintain. Even though the VK-5 was dimensionally similar to the VK-1, a redesign of the engine nacelles proved necessary after all. Changes were made to the engine bearers, the detachable annular cowlings, the cooling air ducts and the internal structure of the nacelles' rear sections to accommodate the new extension jetpipes. The engine controls were modified, the electric wiring inside the nacelles was rerouted, a new fire suppression system was installed and the engines' foreign object damage (FOD) protection screens made of wire mesh were provided with a de-icing system. Outwardly the VK-5 engines were easy to identify by the parabolic air intake centrebodies which incorporated three small ram air intakes for engine accessory cooling instead of the usual two.

Additionally, the lower skins of the outer wings were reinforced. No changes were made to the armament and equipment.

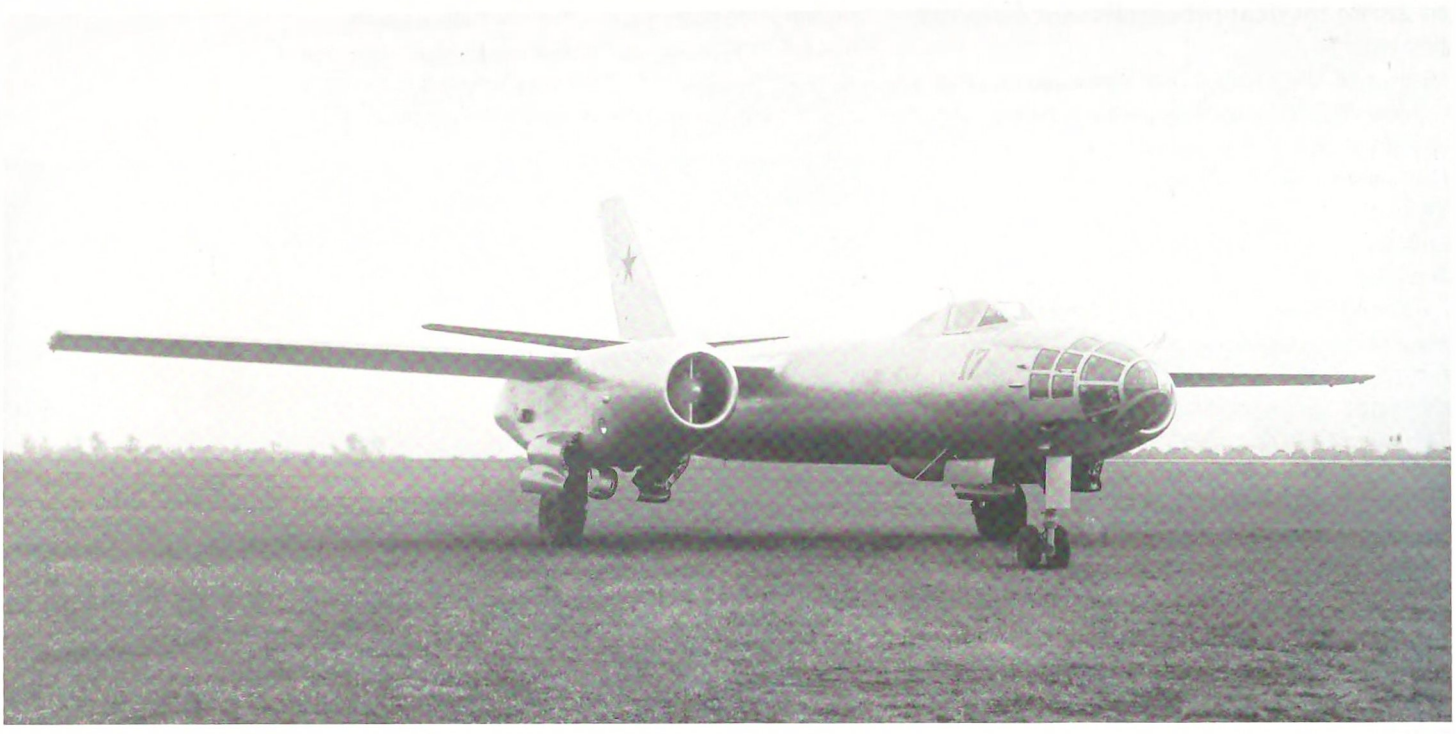
The unserialled IL-28RM prototype (c/n 52003714) first flew on 17th February 1952 but the manufacturer's flight tests were not completed until 12th April (Sergey V. Ilyushin endorsed the test report on 29th April). Thus the state acceptance trials did not commence until 10th July that year; they were duly completed on 15th January 1953. The IL-28RM featured the latest version of the intended powerplant – the VK-5E (*ekono**mich**nyy* – fuel-efficient) incorporating additional measures aimed at reducing the SFC. This engine passed its state acceptance trials concurrently with the aircraft itself.

Specifications of the IL-28RM

	Manufacturer's flight tests	State acceptance trials
Length	17.65 m (57 ft 10⅞ in)	
Wing span (less tip tanks)	21.45 m (70 ft 4³⁵⁄₆₄ in)	
Height on ground	6.0 m (19 ft 8½ in)	
Wing area	60.8 m² (653.76 sq. ft)	
Wing loading, kg/m² (lb/sq. ft)	321 (65.81)	n.a.
Power loading at sea level, kg/kgp (lb/lbst)	3.12	n.a.
Operating empty weight, kg (lb)	13,485 (29,730)	13,467 (29,689)
Normal all-up weight, kg (lb)	19,500 (42,990)	20,200 (44,530)
Maximum AUW (with drop tanks), kg (lb)	22,950 (50,595)	22,930 (50,550)
Fuel load, kg (lb):		
internal	5,030 (11,090)	8,250 (18,190)
with tip tanks	5,030 (11,090)	8,200 (18,080)
Payload, kg (lb):		
normal	6,015 (13,260)	9,467 (20,870)
in overload configuration (with tip tanks)	6,015 (13,260)	n.a.
Maximum speed, km/h (mph):		
at 4,250 m (13,940 ft)	926 (575)/n.a. [1]	n.a.
at 5,000 m (16,400 ft)	877/851 (544/528) [2]	n.a.
at 6,600 m (21,650 ft)	n.a.	891/863 (553/536) [2]
at 7,000 m (22,965 ft)	n.a.	n.a./863 (536) [2]
at 10,000 m (32,810 ft)	862/827 (535/513) [2]	n.a./841 (522) [2]
Rate of climb, m/sec (ft/min):		
at sea level	24.5/17.0 (4,821/3,345) [2]	n.a.
at 5,000 m	15.4/10.3 (3,030/2,027) [2]	n.a.
at 10,000 m	6.6/3.4 (1,299/669) [2]	n.a.
Climb time, minutes:		
to 5,000 m (16,404 ft)	4.2/6.15 [2]	6.2/n.a. [2]
to 10,000 m (32,808 ft)	12.4/9.3 [2]	18.0/n.a. [2]
Service ceiling, m (ft)	13,050/12,175 (42,810/39,940) [2]	12,500/11,500 (41,010/37,730) [2]
Range, km (miles):		
without drop tank separation	3,007 (1,867) [3]	2,090 (1,298) [4]
with drop tank separation	3,042/3,254 (1,889/2,021) [5]	3,250 (2,018) [7]
Endurance:		
without drop tank separation	4 hrs 40 min [3]	n.a.
with drop tank separation	4 hrs 39.5 min/4 hrs 49.5 min [5]	n.a.
Take-off run, m (ft)	963/1,233 (3,159/4,045) [6]	995/1,295 (3,264/4,248) [6]
Take-off distance, m (ft)	1,807/2,477 (5,928/8,126) [6]	2,030/2,400 (6,660/7,874) [6]

Notes:

1. At take-off thrust (N = 11,560 rpm); other data for N = 11,200 rpm
2. At normal/maximum AUW – 19,700/22,570 kg (43,430/49,760 lb) respectively during manufacturer's flight tests and 20,200/22,930 kg (44,530/50,550 lb) respectively during state acceptance trials
3. TOW 23,000 kg (50,705 lb), cruise altitude 10,000 m (32,810 ft) and cruising speed 670 km/h (416 mph).
4. TOW 22,930 kg (50,550 lb), cruise altitude 5,000 m (16,400 ft) and cruising speed 560 km/h (347 mph).
5. TOW 23,000 kg, cruise altitude 10,000/10,500-12,500 m (32,810/34,450-41,010 ft) and cruising speed 682/695 km/h (423/431 mph) respectively.
6. At normal/maximum TOW respectively.
7. At optimum cruise altitude and cruising speed 665 km/h (413 mph).



'17' (c/n 52003719), the second of two prototypes of the VK-5 powered bomber version, seen during manufacturer's tests. Note the angular cockpit windshield, the wingtip fixtures for tip tanks and the absence of the wing-mounted pitot.

Still, the performance increase proved to be negligible. On 20th May 1953 Minister of Aircraft Industry Pyotr V. Dement'yev and Air Force C-in-C Air Marshal Pavel F. Zhigarev reported thus to the CofM Presidium's Bureau of Machinery Industries:

'Check-up state acceptance trials have shown that [...] the aircraft's maximum speed increase is a mere 10-11 km/h [6.21-6.83 mph]. With a 2,950-kg [6,500-lb] increase of the all-up weight, including a 1,000-kg [2,204-lb] increase of the bomb load, the aircraft's range has increased by 620 km [385 miles] and the take-off run by 220 m [720 ft]. Flight tests have revealed [...] unstable engine operation (surge) in flight, excessive turbine temperatures at full military power at altitudes above 7,000 m [22,965 ft] and difficulties with engine starting. The VK-5 engine is not yet ready for production.

In view of the fact that the IL-28's performance increase with the VK-5 engines is negligible, we consider it advisable to [...] cancel further work in this direction.'

Due to the cancellation of the IL-28S and Tu-93 projects for which the new engine was primarily intended (the Tu-93 torpedo-bomber was a VK-5 powered derivative of the Tu-14 with a fatter fuselage holding more fuel) the VK-5 did not enter production – and therefore neither did the IL-28RM. Besides, by then it was clear that axial-flow turbojets were superior to centrifugal-flow engines.

IL-28 experimental tactical bomber with VK-5 engines

The next version to receive the VK-5s was the regular bomber. Logically this aircraft should have been designated IL-28M, but no separate designation was allocated for some reason and the designation IL-28M was eventually used for a different version (see below). Development of the re-engined bomber variant was initiated by Council of Ministers directive No.5329-2088ss of 29th December 1952 and MAP order No.1ss of 1st January 1953.

The two prototypes were converted from standard Moscow-built IL-28s; the first machine (c/n 52003701), which is sometimes reported in error as an IL-28RM, had no serial and the second aircraft (c/n 52003719) was serialled '17'. Pursuant to the abovementioned CofM directive the first prototype was to be transferred to LII for testing, while the other aircraft was to be delivered to GK NII VVS in April 1953 for state acceptance trials.

Apart from the engines, the bombers incorporated a few other changes. Both aircraft had wings taken from the IL-28R, with detachable tip tanks to extend range. The second prototype featured enlarged 1,260x390 mm (49.6x15.35 in) mainwheels borrowed from the IL-28R and an automatic wheel braking system, while the first prototype retained the standard 1,150x355 mm (45.27x13.97 in) mainwheels. The 12-A-30 lead-acid DC batteries were replaced by new 12SAM-25 lead-acid batteries (*star**tyor**naya, aviatsi**on**naya, mono**bloch**naya* [*akkumu**lya**tornaya bata**re**ya*] – aircraft-type monobloc starter battery), which were moved forward to the radar bay in order to shift the CG forward.

The defensive armament was identical to that of the standard IL-28, comprising two nose-mounted NR-23s with 100 rpg and two NR-23s with 225 rpg in the tail turret. The normal bomb load and the maximum bomb load were 1,000 kg (2,204 lb) and 2,000 kg (4,410 lb) respectively.

Specifications of the VK-5 powered IL-28 bomber prototypes

	Manufacturer's flight tests c/n 52003701	c/n 52003719	State acceptance trials c/n 52003701	c/n 52003719
Length	17.65 m (57 ft 10⅞ in)			
Wing span	21.45 m (70 ft 4³⁄₆₄ in)			
Wing area	60.8 m² (653.76 sq. ft)			
Wing loading, kg/m² (lb/sq. ft)	308 (63.14)	311 (63.76)	322 (66.0)	326 (66.83)
Power loading at sea level, kg/kgp (lb/lbst)	3.2	3.2	3.16	3.2
Operating empty weight, kg (lb)	13,350 (29,430)	13,560 (29,890)	13,113 (28,908)	13,365 (29,464)
Normal all-up weight, kg (lb):				
normal	18,710 (41,250)	18,920 (41,710)	19,600 (43,210)	19,850 (43,760)
maximum (with tip tanks)	24,090 (53,110)	24,300 (53,570)	24,050 (53,020)	24,220 (53,395)
Fuel load, kg (lb):				
internal	3,800 (8,380)	3,800 (8,380)	3,800 (8,380)	3,800 (8,380)
with tip tanks	8,000 (17,640)	8,000 (17,640)	8,000 (17,640)	8,000 (17,640)
Payload, kg (lb):				
normal	5,360 (11,820)	4,360 (9,610)	6,487 (14,301)	6,485 (14,300)
maximum	10,740 (23,680)	10,740 (23,680)	10,837 (23,891)	10,855 (23,930)
Top speed at 19,300 kg (42,550 lb) AUW and N = 11,560 rpm, km/h (mph):				
at sea level	800 (496) [1]	800 (496) [1]	800 (496) [1]	800 (496) [1]
at 2,850 m (21,650 ft)	917 (569)	n.a.	n.a.	n.a.
at 3,000 m (22,965 ft)	n.a.	918 (570)	911 (565)	900 (559)
at 4,000 m (13,940 ft)	n.a.	921 (572)	n.a.	n.a.
at 5,000 m (16,400 ft)	900 (559)	918 (570)	n.a.	n.a.
at 10,000 m (32,810 ft)	828 (514)	n.a.	844 (524)	844 (524)
Landing speed, km/h (mph)	189 (117)	186 (115)	n.a.	n.a.
Rate of climb at 19,300 kg AUW and N = 11,250 rpm, m/sec (ft/min):				
at sea level	21.5 (4,231)	19.5 (3,837)	n.a.	n.a.
at 5,000 m	13.9 (2,735)	13,1 (2,578)	n.a.	n.a.
at 10,000 m	6.5 (1,279)	6.75 (1,328)	n.a.	n.a.
Climb time at 19,300 kg AUW and N = 11,250 rpm, min:				
to 5,000 m	4.85	5.25	n.a.	n.a.
to 10,000 m	13.3	13.8	14.0	14.0
Effective range with drop tanks and 2,000 kg (4,410 lb) of bombs, km (miles)	3,000 (1,863)	3,000 (1,863)	2,710 (1,683)	2,670 (1,658)
Technical range, km (miles):				
with drop tanks and 2,000 kg of bombs	3,100 (1,925) [1]	3,012 (1,870) [2]	2,820/3,020(1,751/1,870) [5]	2,790/2,980(1,733/1,850) [6]
without drop tanks/with 1,000 kg (2,204 lb) of bombs	1,298 (806) [3]	1,309 (1,870) [4]	n.a.	n.a.
Endurance:				
with drop tanks and 2,000 kg of bombs	4 hrs 51 min [1]	4 hrs 33 min [2]	n.a.	n.a.
without drop tanks/with 1,000 kg of bombs	2 hr s07 min [3]	2 hrs 02 min [4]	n.a.	n.a.
Take-off run, m (ft):				
at normal TOW	920 (3,020)	945 (3,100)	1,000 (3,280)	1,050 (3,440)
at maximum TOW	1,410 (4,630) [7]	1,430 (4,690) [8]	1,370 (4,490)	1,360 (4,460)
Take-off distance, m (ft):				
with normal TOW	1,875 (6,150)	2,000 (6,560)	1,760 (5,770)	1,954 (6,410)
with maximum TOW	2,525 (8,280) [7]	2.708 (8,880) [8]	2,415 (7,920)	2,345 (7,690)
Landing run, m (ft):				
no airbrakes	913 (2,995)	n.a.	660 (2,165)	800 (2,620)
airbrakes deployed	607 (1,990)	524 (1,720)	550 (1,800)	660 (2,165)
Landing distance, m (ft):				
no airbrakes	1,692 (5,550)	n.a.	n.a.	n.a.
airbrakes and brake parachute deployed	1,255 (4,120)	3,618)	n.a.	n.a.

Notes:
1. TOW 24,170 kg (53,280 lb), cruising speed 650 km/h (403 mph) and cruise altitude 10,500-13,200 m (34,450-43,310 ft).
2. TOW 24,330 kg (53,640 lb), cruising speed 680 km/h (422 mph) and cruise altitude 10,500-13,100 m (34,450-42,980 ft).
3. TOW 18,710 kg (41,250 lb), cruising speed 650 km/h and cruise altitude 10,000 m (32,810 ft).
4. TOW 18,920 kg (41,710 lb), cruising speed 700 km/h (434 mph) and cruise altitude 10,000 m.
5. TOW 24,050 kg (53,020 lb), cruising speed 668 km/h (415 mph) and cruise altitude 10,000 m/ 10,000-12,000 m (32,810/32,810-39,370 ft).
6. TOW 24,220 kg (53,395 lb), cruising speed 668 km/h and cruise altitude 10,000 m/ 10,000-12,000 m.
7. TOW 23,800 kg (52,470 lb).
8. TOW 24,000 kg (52,910 lb).

Both aircraft were completed within a short time and duly tested; General Designer Sergey V. Ilyushin endorsed the manufacturer's flight tests report on 28th April 1953 and the state acceptance trials report was endorsed exactly three months later. On 10th September 1953 GK NII VVS recommended the VK-5 powered IL-28 for series production. Still, the upgraded bomber did not enter production for the reasons stated above.

It deserves mention that an upgraded version of the navigator's ejection seat was developed in 1953 and underwent ground tests on a VK-5 powered IL-28 at GK NII VVS on 3rd-10th October 1953. The report mentions the aircraft exactly as a VK-5 powered IL-28 (without quoting any suffix letter), so it may be assumed that the aircraft in question was one of the bombers. As mentioned earlier, the navigator sat on a jump seat in the extreme nose when working with the optical sight and/or the radar; in an emergency, when he needed to move back to the ejection seat and strap himself in, time became crucial. Hence instead of a regular harness with shoulder straps (which were hooked up to the navigator's entry hatch cover when not in use) the modified seat featured a semi-rigid restraining bar hinged on one side, with a locking mechanism at the other end. The navigator could snap this bar into the locked position with either hand, without even looking at it, in just one or two seconds versus 10-15 seconds for the standard harness. The report, which was signed by OKB-240 project engineer Dmitriy V. Leshchiner and design team chief Valeriy A. Borog, recommended that the seat be flight-tested; it is not known whether this was actually done.

IL-28TM experimental torpedo-bomber

The IL-28TM torpedo-bomber (*torpedo**nos**ets modifi**tsee**rovannyy*) was the last of the three variants modified to take the VK-5 engine. It was developed in accordance with Council of Ministers directive No.7218rs of 22nd May 1953 and Ministry of Defence Industry (MOP – *Mini**ster**stvo obo**ron**noy pro**mysh**lennosti*) order No.295ss of 27th May. The schedule stipulated by the Government was extremely tight: the prototype was to be handed over to the Navy's NII-15 in just one month.

In those days it was customary in the Soviet Union to comply strictly with government orders and directives concerning the defence industry, whatever the cost. OKB-240 managed to complete the prototype within the stated time frame by converting the first prototype of the 'long-bay' IL-28T (c/n 50301106). The installation of VK-5 engines led to several associated changes as described under the IL-28RM heading. Furthermore, a seventh fuel cell (No.3B) was added, wingtip tanks were installed and the oxygen bottles were relocated. The higher gross weight required the standard mainwheels to be replaced with 1,260x390 mm (49.6x15.35 in) mainwheels as on the IL-28R. Finally, the starboard forward-firing cannon was reinstated, with an ammunition supply of 100 rounds.

Still wearing the serial '4 Red', the aircraft first flew on 22nd June 1953, completing its manufacturer's flight tests in just a week (the test report was signed on 30th June). In July it underwent state acceptance trials; the Soviet Navy's NII-15 issued its trials report on 1st August. Nevertheless, the IL-28TM fared no better that the other versions sharing the VK-5 powerplant.

IL-28-131 guided bomb carrier

Back in the early 1950s the Soviet Union started experimenting with precision-guided munitions (PGMs). This work was inspired both by German wartime research and by the use of guided bombs in the Korean War by the Americans. On 15th October 1951 the Council of Ministers issued a directive tasking the Ministry of Agricultural Machinery's KB-2 design bureau

The IL-28TM's weapons configurations

Normal weapons load	Total weight, kg (lb)	Maximum weapons load	Total weight, kg (lb)
2 x FAB-500M-46 bombs	1,000 (2,204)	12 x OFAB-100 bombs	1,200 (2,645)
1 x 45-36AMV torpedo	1,073 (2,365)	8 x FAB-250M-46 bombs	2,000 (4,409)
1 x 45-36MAN torpedo	1,030 (2,270)	4 x FAB-500M-46 bombs	2,000 (4,409)
1 x RAT-52 torpedo	615 (1,355)	1 x FAB-1500M-46 bomb	1,500 (3,306)
2 x AMD-4-500 mines	1,018 (2,244)	1 x FAB-3000M-46 bomb	3,000 (6,613)
1 x AMD-4-1000 mine	1,018 (2,244)	1 x TAS torpedo	1,520 (3,350)
1 x Leera mine	988 (2,178)	1 x TAV torpedo	1,283 (2,828)
1 x Desna mine	768 (1,693)	4 x AMD-4-500 mines	2,018 (4,448)
		1 x AMD-M mine	1,188 (2,619)
		1 x Serpey mine	1,268 (2,795)
		2 x 45-36AMV torpedoes	2,128 (4,691)
		2 x Leera mines	1,958 (4,316)
		2 x Serpey mines	2,518 (5,551)
		2 x Desna mines	1,518 (3,346)

Specifications of the IL-28TM prototype

	Manufacturer's flight tests	State acceptance trials
Length	17.65 m (57 ft 10⅞ in)	
Wing span (less tip tanks)	21.45 m (70 ft 4³⁄₆₄ in)	
Wing area	60.8 m² (653.76 sq. ft)	
Wing loading, kg/m² (lb/sq. ft)	380 (77.9)	366 (75.0)
Power loading at sea level, kg/kgp (lb/lbst)	3.3	3.56
Operating empty weight, kg (lb)	13,395 (29,530)	13,395 (29,530)
Normal all-up weight, kg (lb)	18,790 (41,424)	18,788 (41,419)
Maximum all-up weight, kg (lb):		
with tip tanks	22,070 (48,655)	22,068 (48,650)
with tip tanks and PSR-1500-15 JATO boosters	22,550 (49,710)	n.a.
Fuel load, kg (lb):		
internal	3,800 (8,380)	3,800 (8,380)
with tip tanks	6,880 (15,170)	6,880 (15,170)
Payload, kg (lb):		
normal	5,397 (11,898)	5,383 (11,867)
maximum	8,675 (19,120)	8,663 (19,098)
Top speed at 22,070 kg (48,655 lb) TOW and take-off power, km/h (mph):		
at sea level	800 (496) [1]	800 (496) [1]
at 5,000 m (16,400 ft)	901 (559)	895 (555)
at 10,000 m (32,810 ft)	836 (519)	837 (519)
Landing speed, km/h (mph)	188.5 (117)	178 (110) [2]
Rate of climb at 22,070 kg TOW and cruise power, m/sec (ft/min):		
at sea level	15.4 (3,030)	16.3 (3,207)
at 5,000 m	11.22 (2,208)	9.3 (1,830)
at 10,000 m	6.85 (1,348)	4.0 (787)
Climb time at 22,070 kg TOW and cruise power rating, minutes:		
to 5,000 m	6.36	6.6
to 10,000 m	6.85	19.5
Effective range at 10,000 m with tip tanks and 45-36MAV torpedo, km (miles)	2,172 (1,349)	2,166 (1,345)
Technical range, km (miles):		
at 10,000 m and 600 km/h (372 mph) with tip tanks and 45-36MAV torpedo		
ditto, at 10,400-12,550 m (34,120-41,170 ft) and 585-900 km/h (363-559 mph)	2,326 (1,444)	2,315 (1,437)
Technical range with drop tanks and 45-36MAV torpedo, km (miles)	2,499 (1,552)	n.a.
Endurance:		
at 10,000 m with drop tanks and 45-36MAV torpedo	3 hrs 48 min	3 hrs 41 min
ditto, at 10,400-12,550 m and 585-900 km/h	4 hrs 20 min	n.a.
Take-off run at maximum TOW, m (ft)	1,090 (3,580)	1,260 (4,130)
Take-off distance at maximum TOW, m (ft)	2,055 (6,740)	2,025 (6,640)
Landing run, m (ft)	890 (2,920)	940 (3,080) [3]
Landing distance, m (ft)	1,510 (4,950)	2,125 (6,970) [3]

Notes:
1. Speed limited due to dynamic strength limit.
2. Data for VK-1 powered IL-28T.
3. Data for VK-1 powered IL-28T with a 15,000-kg (33,070-lb) landing weight.

headed by Aleksandr D. Nadiradze with developing the UB-2000F ***Chai**ka* (Seagull) and UB-5000F Kondor radio-controlled gliding bombs (UB = *oopravl**ya**yemaya **bom**ba* – guided bomb). In December 1951 KB-2 merged with plant No.67 to form GSNII-642 (*Gosu**dar**stvennyy so**yooz**nyy na**ooch**no-is**sled**ova-tel'skiy insti**toot*** – All-Union State Research Institute; the 'all-Union' bit indicated that the establishment had national importance). This institute carried on with the development of the bombs.

Outwardly the UB-2000F bore a certain resemblance to the German SD-1400X Fritz X gliding bomb of Second World War vintage, featuring a squashed-X wing arrangement with 28° dihedral for the

upper pair and 28° anhedral for the lower pair; apart from the need to provide adequate ground clearance, this was dictated by vertical and horizontal control authority requirements. However, the wings were of cropped-delta planform with 45° leading-edge sweep (due to the high speed of the aircraft), and the casing had a constant diameter. In contrast, the German bomb had unswept trapezoidal wings and a bulged warhead section. The Soviet bomb's twin-fin tail unit was also totally different from the German bomb's box-like structure supported by cruciform struts.

The 2,240-kg (4,940-lb) UB-2000F had a 1,795-kg (3,960-lb) HE warhead, hence the F (*foo**gahs**naya* – high-explosive). The bomb could be released at 5,000-15,000 m (16,400-49,210 ft) and 400-900 km/h (248-559 mph). Like its German forebear, it was controlled by means of oscillating spoilers and the tail surfaces. Guidance was exercised by means of a KRU-UB radio command system (*ko**manhd**noye **rah**dio'upravl**en**iye oopravl**ya**yemoy **bom**boy*) and the bomb's BU-2 control module (*blok oopravl**en**iya*), which included an AP-59 autopilot. The aircraft's on-board part of the KRU-UB system transmitted the guidance signals in continuous mode. The system had three transmitters operating in different wavebands simultaneously to frustrate jamming; however, only one of the 600 possible frequencies was actually used at a time for bomb guidance, the other two frequencies being intended for deceiving the enemy. A special OPB-2UP periscopic synchronised bombsight was used for dropping free-fall and guided bombs in level flight. It automatically signalled proximity to the moment of bomb release and dropped the bomb at the right time.

The UB-2F used triangulation as the principal guidance method, the bombardier keeping the bomb on a straight line between the aircraft and the target. If no commands were forthcoming the bomb glided in a shallow dive, staying below the line connecting the aircraft and the target; therefore it needed to be guided onto this line by programmed commands before triangulation guidance could begin. As the bomb's speed was lower than that of the aircraft, triangulation could only be performed after the aircraft had passed over the target, the bomb executing a programmed turn to dive onto the target. For example, when dropped at 7,000 m (22,965 ft), it was released at a distance of 2.6 km (1.6 miles) from the target, then travelled more than 4 km (2.5 miles) in the same direction and made a U-turn for the final dive when the bomber was already 5 km (3.1 miles) beyond the target.

An experimental batch of UB-2000Fs was manufactured as early as 1953. Initial tests to confirm the bomb's advertised accuracy were held between November 1954 and February 1955, involving 15 drops from specially modified IL-28s. They showed that two or three 'smart bombs' were enough to destroy a target measuring 30x70 m (100x230 ft) which would have required the expenditure of 168 FAB-1500 'dumb bombs'. A further 20 drops were made by IL-28s and Tu-4s during the state acceptance trials, which began on 20th July 1955, with good results. Hence on 1st December 1955 the Council of Ministers issued directive No.2000-1070, including the UB-2000 into the VVS inventory as the UB-2F Chaika (*izdeliye* 4A22); a batch of 120 such bombs was manufactured in 1956.

Twelve (according to other sources, about 30) *Beagles* were converted to IL-28-131 configuration in 1956 for carrying these PGMs. Apart from the bomb itself, which was prominently carried externally under the fuselage, the IL-28-131 could be identified by a small angular fairing under the nose housing the lens of the OPB-2UP bombsight; this allowed the navigator to guide the bomb, using the red tracer flares at the tips of the horizontal tail. The lens was movable and tilted

One of the few IL-28-131 bombers adapted to carry the UB-2000F (UB-2F Chaika) gliding bomb, which can be seen under the fuselage. Note the undernose fairing for the OPB-2UP periscopic bomb sight.

past the vertical, tracking the bomb as the latter fell behind the aircraft.

The UB-2F's operational use technique had several inherent flaws. For one thing, the guidance system could only be used in good visibility conditions when the bomb and the target could be observed through the sight; for another, the bomber needed to pass in a straight line directly above the target, which made it vulnerable to enemy air defences. Hence the UB-2F was withdrawn from the inventory as early as 1957.

IL-28 stand-off missile carrier

In 1948 the same KB-2 started work on the RAMT-1400 stand-off anti-shipping missile – the first of its kind in the Soviet Union (the work continued post-1951 at GSNII-642); the design effort was led by M. V. Orlov. In the then-current Soviet terminology the weapon was known as a 'winged torpedo' (hence RAMT for *re'ak**tiv**naya aviatsi**on**naya mor**ska**ya tor**peda*** – jet-propelled aerial sea torpedo). In line with its naval application the missile was called ***Shchoo**ka* (Pike, the fish).

Two guidance system versions were envisaged; the RAMT-1400A (Shchooka-A) missile had radio command line-of-sight guidance, using an optical sight, pending availability of something better. The 'something better' was an inertial system for initial guidance and an active radar homing system for terminal guidance, which were to be fitted to the RAMT-1400B (Shchooka-B). This was set forth in Council of Ministers directive No.5766-2166 dated 27th December 1949.

The missile had a mid-wing layout with unswept wings, an unswept butterfly tail (apparently to facilitate carriage under a bomber's fuselage) and a single-chamber liquid-propellant rocket motor. The high-explosive warhead contained 320 kg (705 lb) of TGAG-5 explosive compound; it was designed to be jettisoned when the missile dived into the water and, thanks to a special hydrodynamic ring altering its course, move in an upward arc to hit the ship from below. The RAMT-1400A version was 6.7 m (21 ft 11$^{25}/_{32}$ in) long, with a wing span of 4.0 m (13 ft 1$^{31}/_{64}$ in); it had a 2,000-kg (4,410-lb) launch weight, including a warhead weighing 615-650 kg (1,355-1,433 lb), and a maximum range of 30 km (18.6 miles).

The first test launch of the RAMT-1400A with only an autopilot (not even the radio command guidance system was fitted) took place at the naval target range on the Black Sea near Feodosiya on 16th June 1949. A version with a captured German radio command guidance system designed by Henschel AG was tested in 1950, followed by a version with the indigenous KRU-Shchooka radio command guidance system in August-November 1951; decommissioned minesweepers, torpedo boats and motor barges served as the targets. Initially Tu-2T torpedo-bombers served as the missile platforms (or rather weapons testbeds), but soon an IL-28 was modified to carry the missile. This, in turn, required changes to the missile's airframe to suit the higher speed: the nose was reshaped, the angle of the V tail was reduced from 40° to 35° and the area of the tail surfaces was increased.

14 launches made from the *Beagle* in October-December 1952 showed that the 'kill' probability varied from 51% to 57%, depending on the launch range. The airmen participating in the trials included test pilot Aleksey P. Yakimov and navigator B. M. Timoshok; A. I. Solov'yov was the engineer in charge of the trials.

Pursuant to Council of Ministers directive No.2003-924 issued on 23rd September 1954 a small batch of RAMT-1400A missiles was manufactured for evaluation purposes. A previous Council of Ministers directive (No.3572 dated 6th April 1954) stipulated that 12 IL-28s be modified to carry the missiles; however, actually only two *Beagles* were modified. These aircraft were used in experiments at the NII VVS target range near Vladimirovka, Astrakhan' Region (now Akhtoobinsk), as the same directive envisaged using 20 RAMT-1400A missiles against ground targets. The land strike version was to have a larger 900-kg (1,980-lb) warhead.

Development of the radar-homing RAMT-1400B was making much slower progress. This version had larger dimensions – a length of 6.8 m (22 ft 3$^{23}/_{32}$ in) and a wing span of 4.55 m (14 ft 11$^{7}/_{64}$ in), a launch weight of 1,830-1,900 kg (4,030-4,190 lb) and a 620-kg (1,370-lb) warhead. The launch technique was as follows. After being released by the aircraft at 2,000 m (6,560 ft) the missile glided, the radio altimeter coming into play to bring it into level flight at 60 m (200 ft); then the rocket motor was ignited and the missile flew on at this altitude, accelerating to 1,030 km/h (639 mph). The radar seeker head was switched on 10-20 km (6.2-12.4 miles) from the target, providing directional control and generating a target lead to allow for the ship's forward speed. Pitch control was enabled 750 m (2,640 ft) from the target and the missile dived into the water 60 m from the target.

First, five RAMT-1400Bs with no seeker head (with only the radio altimeter) were tested in 1953, the decommissioned freighter S/S *Ochakov* serving as the target. A further nine launches of the B version followed in 1954, including five fully equipped missiles. However, NII-885, which was responsible for the guidance system, had run into serious difficulties; several versions of the radar seeker head were tested and found unsatisfactory. In a sea state of 3 or 4, target lock-on became unstable at a range of 2-3 km (1.24-1.86 miles) because of background clutter. Development of the radar seeker head was first reassigned to another OKB, but in 1956 the government ran out of patience; on 3rd February 1956 the Council of Ministers issued directive No.175-104 cancelling production of the RAMT-1400A and halting

Opposite page, top: Two views of the first prototype IL-28Sh attack aircraft ('01 Red') at GK NII VVS during trials. The twelve wing pylons are clearly visible.

development of the RAMT-1400B. (It may be added that the name Shchooka later passed to a seriously redesigned version of this weapon – the KSShch surface-to-surface missile (*korabel'nyy snaryad 'Shchooka'* – shipboard, i.e., surface-to-surface missile), alias P-1 *Strela* (Arrow; NATO SS-N-1 *Scrubber*), which saw production and Soviet Navy service.)

IL-28PL anti-submarine warfare aircraft

The deployment of Soviet ballistic missiles to Cuba in 1961, which triggered the Cuban Missile Crisis and almost led to a full-scale nuclear war between the East and West (see Chapter 6), worried the NATO nations immensely, causing them to step up their submarine activities. This, in turn, led the Soviet Union to bolster its Navy, including the AVMF. Not having enough anti-submarine warfare (ASW) aircraft to monitor the activities of Western navies along the Soviet Union's maritime borders and destroy intruding submarines, the AVMF decided to convert some of the bombers it had for this role.

In particular, the Baltic Fleet's 759th OMTAP (*otdel'nyy minno-torpednyy aviapolk* – Independent Minelayer & Torpedo-Bomber Regiment), the very unit involved in the Cuban Missile Crisis, converted ten IL-28 bombers and IL-28T torpedo-bombers into ASW aircraft designated IL-28PL (*protivolodochnyy* – anti-submarine). Actually these were not true ASW aircraft but rather weapons platforms, as the *Beagle* simply had no room for the sonar system and its operator that were all-important for hunting subs. The IL-28PL operated as part of a 'hunter-killer' team in similar manner to the US Navy's Grumman Guardian shipboard ASW system (the AF-2W sensor platform and the AF-2S weapons platform) or, in later days, the Soviet Navy's Kamov Ka-27 *Helix-A* shipboard ASW helicopter. Unlike these types, however, the 'hunter' aircraft in the pair was not a sister ship but an obsolete piston-engined Beriyev Be-6PLO *Madge* flying boat (*protivolodochnaya oborona* – ASW) fitted with the Soviet Navy's first airborne sonar system. Developed in late 1952 and named Baku after the capital of Azerbaijan SSR, the system (which was also fitted to the Ka-25PL *Hormone-A* shipboard ASW helicopter) comprised the SPARU-55 Pamir receiver (*samolyotnoye priyomnoye avtomaticheskoye radio'ustroystvo* – 'aircraft-mounted automatic radio receiver device', 1955 model) with a direction finder and a set of RGB-N Iva passive sonobuoys (Willow, pronounced *eeva*; RGB = *radioghidroakusticheskiy booy*).

Opposite page, bottom: '02 Red', the second prototype IL-28Sh, with 12 UB-16-57 FFAR pods attached. The bottom photo shows the aircraft with compatible weapons arrayed for the benefit of some visiting top brass.

In contrast, the IL-28PL was armed with an AT-1 electrically powered homing torpedo (*izdeliye* 242). Developed In the late 1950s by NII-400 under the direction of A. G. Belyakov as the PLAT-1 (*protivolodochnaya aviatsionnaya torpeda* – anti-submarine aerial torpedo), this weapon was officially included into the AVMF inventory in 1962. The AT-1 was compact enough to be carried internally by the IL-28PL, being 3.9 m (12 ft 9$^{35}/_{64}$ in) long, and weighed 530 kg (1,170 lb). It could not boast particularly high performance, having a range of 5 km (3.1 miles), a speed of 28 kts (51.8 km/h or 32.17 mph) and a travel depth of 20-200 m (65-660 ft). The torpedo was dropped from up to 2,000 m (6,560 ft), descending by parachute; after splashdown it followed a circular course until the acoustic seeker head detected the presence of a submarine.

Officially the reason for the IL-28PL's existence was the necessity to provide 'on-call' ASW support once it had been requested by whoever spotted a hostile sub, since the IL-28 was more than twice as fast as the Be-6PLO and could be summoned on the double. Besides, the flying boats were difficult to operate in winter when their bases froze up. But perhaps the real reason was the naval command's wish to stop the 'Beagle kennels' from being disbanded, as they inevitably would be, and keep the pilots flying.

In 1966 the HQ of the Baltic Fleet air arm approached the Soviet Navy's GHQ, requesting the formation of two further regiments equipped with the IL-28PL, but the request was turned down. Thus the 759th OMTAP was the sole operator of this version.

IL-28 attack aircraft prototypes

As early as 1952 the Ilyushin OKB attempted to adapt the *Beagle* for the close air support (CAS) role. One IL-28 was fitted experimentally with six 190-mm (7.48-in) TRS-190 Strela spin-stabilised unguided rockets carried in PU-O-46 launch tubes (*pooskovoye oostroystvo odinochnoye* – single-round launcher) on underwing pylons. (TRS = *toorbore'aktivnyy snaryad* – lit. 'turbojet-powered missile'; in reality it had a solid-fuel rocket motor.) The aircraft underwent manufacturer's tests in 1952 and was transferred to GK NII VVS that same year. The test results were acceptable, but the TRS-190 did not gain wide use, and no more *Beagles* were thus armed.

In the summer of 1953 another IL-28 was experimentally modified to take the AS-21 weapons system comprising six 212-mm (8.34-in) ARS-212 *Ovod* (Gadfly) unguided rockets (*aviatsionnyy re'aktivnyy snaryad* – aircraft rocket) on PU-21 launch rails. The 118-kg (260-lb) rocket, which was known as the S-21 in production form, had four stabilising fins and a 46-kg (101-lb) high-explosive/fragmentation warhead. The military considered using the IL-28 thus armed as an interceptor against formations of enemy aircraft (!), but the idea was not pursued further.

IL-28Sh attack aircraft

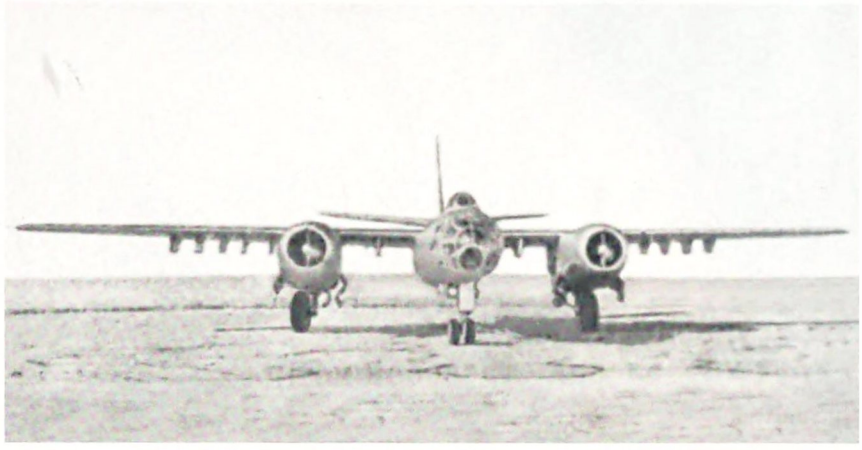
In the late 1950s the Ilyushin OKB dusted off the idea of an IL-28 ground attack version. This involved installing a

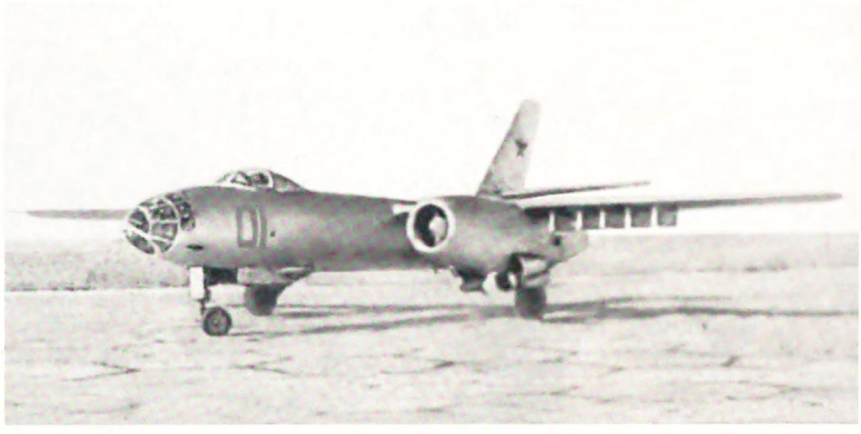
battery of 20 unguided rockets in the bomb bay. This would give adequate firepower without spoiling the aircraft's aerodynamics with high-drag external stores. The launch tubes were to be mounted almost vertically, firing downward and aft; a salvo of rockets equipped with shaped-charge armour-piercing (SCAP) warheads was expected to be an effective way of destroying armoured vehicles. The crew was reduced to two, the navigator/bomb aimer being eliminated. However, it was quickly established that, with no exhaust gas outlets for the rockets on the upper fuselage, the kick of a 20-rocket salvo would make the aircraft lose control, and the idea was dropped.

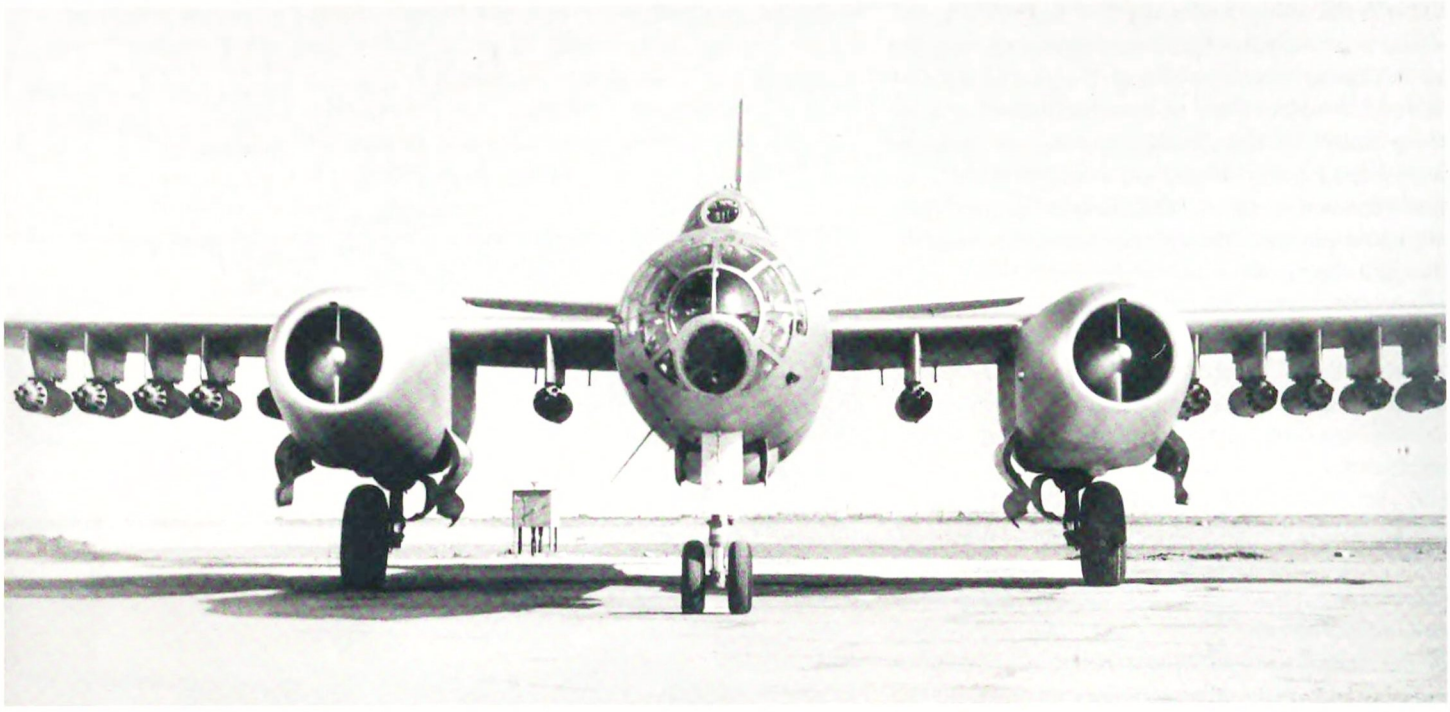
Still, the limited warload of the day's fighter-bombers forced the military and the OKB to revive the concept once again. The specification for such an aircraft was drawn up in the spring of 1967 – apparently as a result of the growing Sino-Soviet tensions which culminated in an armed border conflict in March 1969. The aircraft was to have a combat radius identical to that of the Sukhoi Su-7BM *Fitter-A* fighter-bomber while carrying two or three times the ordnance load. The result was the IL-28Sh (*shtoormo**vik*** – attack aircraft). It featured 12 underwing hardpoints with BD3-U pylons – five outboard and one inboard of each engine. This was considered a more acceptable approach, even at the expense of the extra drag created by the external stores.

Possible weapons included up to twelve UB-16-57 rocket pods, each holding sixteen 57-mm (2.24-in) S-5 folding-fin aircraft rockets (FFARs), to give a maximum of 192 rounds. (The pod's designation means *oonifi**tsee**rovannyy blok* – standardised [rocket] pod, 16 rounds of 57-mm calibre.) Depending on the mission, the pilot could select a salvo launch from all pods or just two, four etc. Other options were up to six 250-mm (9.84-in) S-24 heavy unguided rockets, or various free-fall bombs and submunitions dispensers. The latter included 1954-model FAB-250M-54 high-drag HE bombs and 1962-model FAB-250M-62 low-drag bombs, FAB-500 bombs (including the FAB-500M-62 and the FAB-500Sh low-level strike version with a time-delay fuse), OFAB-250Sh and OFAB-250ShN bombs (*os**kol**ochno-foo**gahs**naya **avia**bom**ba, shtoormo**va**ya, **niz**kovy**sot**naya* – HE/fragmentation bomb for low-altitude missions) optimised for use at 50-500 m (164-1,640 ft), RBK-250 cluster bombs (*__rah__zovaya __bom__bovaya kas__set__a* – 'disposable bomb cassette'), ZAB-500Sh incendiary bombs (*zazhi__gah__tel'naya __avia__bom__ba__*) and ZB-500 napalm tanks (*zazhi__gah__tel'nyy bahk* – incendiary tank). Some sources report that UPK-23-250 gun pods (*oonifi__tsee__rovannyy __push__echnyy kon__tey__ner* – standardised gun pod) with a 23-mm Gryazev/Shipunov GSh-23L twin-barrel cannon and 250 rounds of ammunition were used on the IL-28Sh.

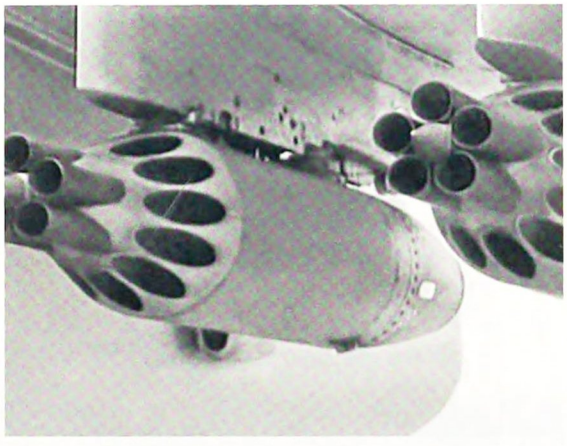
Flight tests began in 1967 with two prototypes bearing the tactical codes '01 Red' and '02 Red'. The



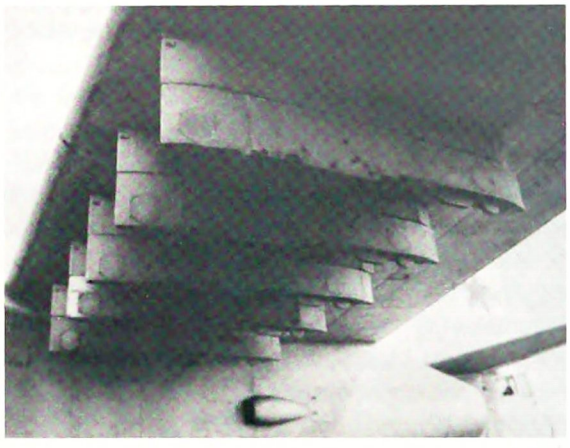




Above: Another view of the IL-28Sh attack aircraft with UB-16-57 pods on all 12 pylons.



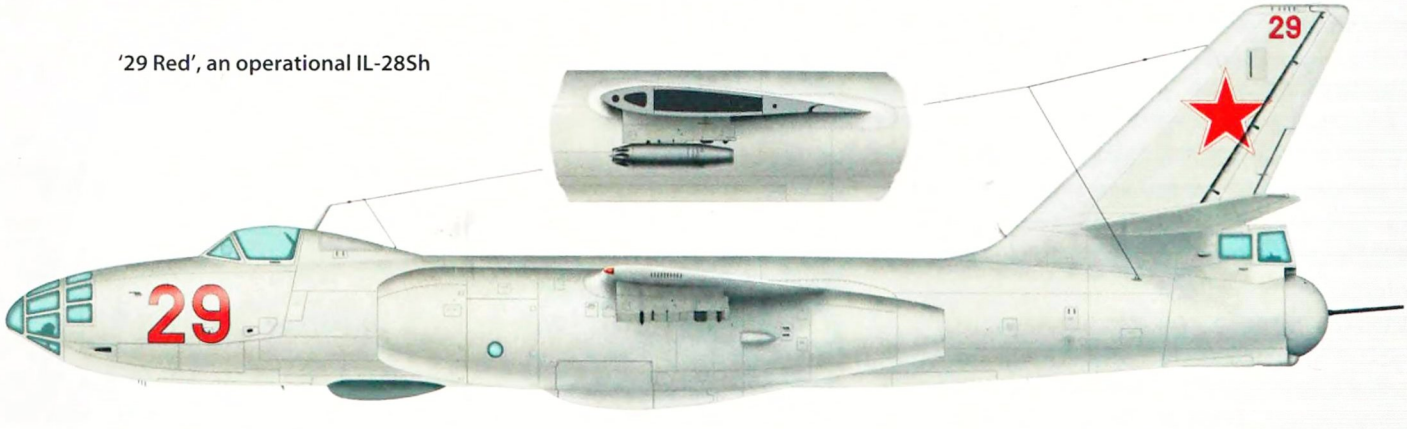
Right: Close-up of the UB-16-57 pods under the port wing

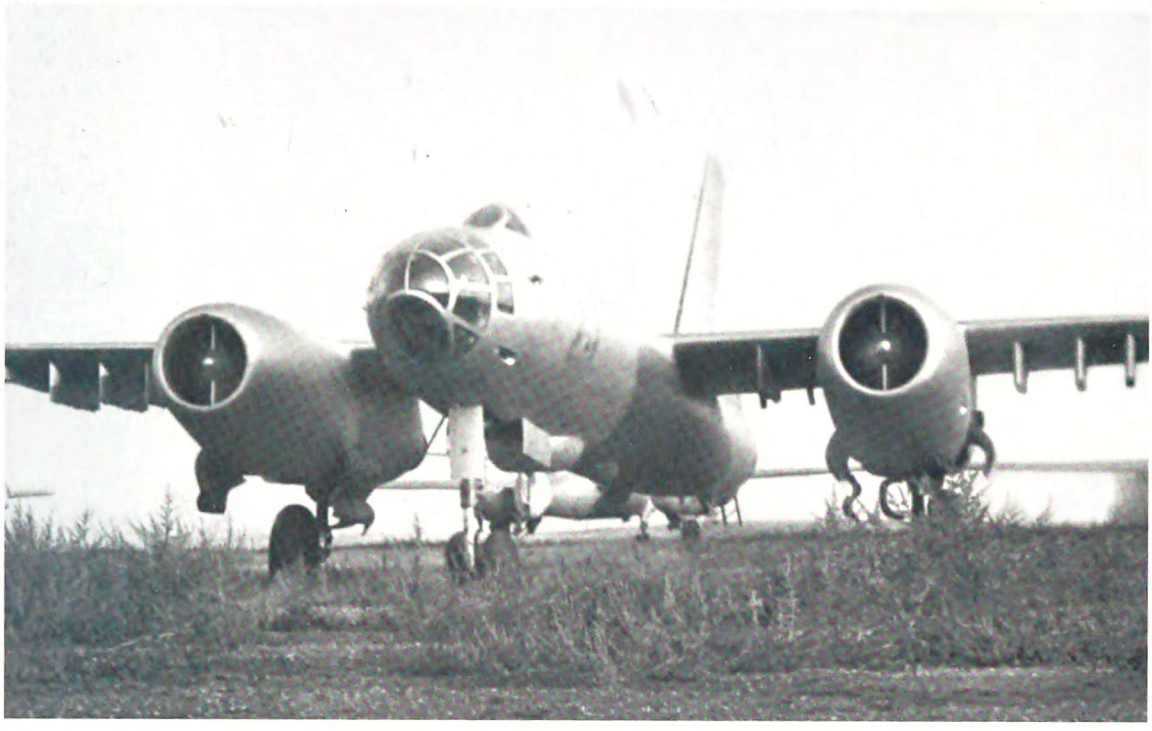


Far right: The Nos. 1-5 weapons pylons of an IL-28Sh.

attack version had an empty weight of 13,200 kg (29,100 lb), a normal take-off weight of 18,660 kg (41,140 lb) and a maximum take-off weight of 22,000 kg (48,500 lb). The IL-28Sh had a maximum speed of 810 km/h (503 mph) but this was limited to 660 km/h (410 mph) below 200 m (660 ft). Fuel consumption at low altitude increased by 30-50% as compared to the basic bomber because of the draggy external stores, and the combat radius with a full complement of FFAR pods was 295 km (183 miles).

'29 Red', an operational IL-28Sh





Decommissioned IL-28Sh '22 Red' is seen in company with a sister ship lacking weapons pylons.

It turned out that the engines showed no inclination to surge or flame out even when all 192 S-5 rockets or all six S-24 rockets were fired at once. Old as they were, the VK-1A engines turned out to be an asset in the ground attack role because centrifugal-flow turbojets were generally less prone to surging after ingesting gun/rocket blast gases. In contrast, firing the S-24 rockets from the more modern Mikoyan MiG-27 *Flogger-D/J* fighter-bomber and Sukhoi Su-25 *Frogfoot* attack aircraft, which were powered by axial-flow turbojets, often led to engine surge.

The IL-28Sh commenced state acceptance trials in October 1967. The GK NII VVS test pilots reported that the aircraft was suitable for low-level and ultra-low-level strike missions. It was established that flying at – and delivering accurate rocket/bomb strikes from – altitudes right down to 60 m (200 ft) could be mastered by service pilots without any trouble; flying still lower, though, demanded a lot of concentration and extra training. The aircraft could be prepared for a sortie within four hours.

Yet, despite all its merits as a strike aircraft, the IL-28Sh had inadequate armour protection and the ejection seats were not yet of the zero-zero type, which meant the crew had no chances of survival if they were unfortunate enough to be shot down at low altitude. Hence the Ilyushin OKB discontinued development of the IL-28Sh and, though originally 300 IL-28 bombers were slated for conversion for the ground-attack role, history records that only a small number were eventually converted at the Soviet Air Force's aircraft repair plants and delivered to first-line units in Eastern Siberia and the Far East.

IL-20 mailplane (second use of designation, 'IL-28P')

The *Beagle* had a paw in the development of civil jet aviation in the Soviet Union as well. In order to familiarise pilots and ground personnel of Aeroflot (the sole Soviet airline) with jets and help Aeroflot to gain practical experience operating them, a handful of IL-28 bombers were delivered new to the airline without armament and targeting equipment, along with at least one IL-28U. Such aircraft were placed on the Soviet civil register and designated IL-20; the designation was reused, having been used earlier for a piston-engined ground attack aircraft prototype of 1948. Some sources call the civil *Beagles* IL-28P (*poch**tov**yy* [*samo**lyot***] – mailplane), but this designation was purely unofficial.

The type was chosen carefully, as the IL-28 was easy to fly and service and posed no problems for Aeroflot crews flying IL-12 *Coach* and Lisunov Li-2P *Cab* (a licence-built Douglas DC-3 derivative) airliners, or Douglas C-47 Skytrain transports transferred from the Air Force after the war. The IL-28's high speed, long range and modern (in its day) avionics allowed the crews to master jet aircraft flying techniques quickly and eased the subsequent transition to the big jets a lot. The aircraft's field performance enabled it to use most of the existing major airports.

The first group of Aeroflot flight crews started conversion training for the IL-20 in October 1953 and the type began carrying freight and mail in late 1954. The IL-20 was much used to deliver matrices of the main Soviet daily newspapers ***Prav**da* (Truth) and *Iz**ves**tiya* (News) from Moscow to Irkutsk where both papers had additional print shops. It also served as a lead-in jet

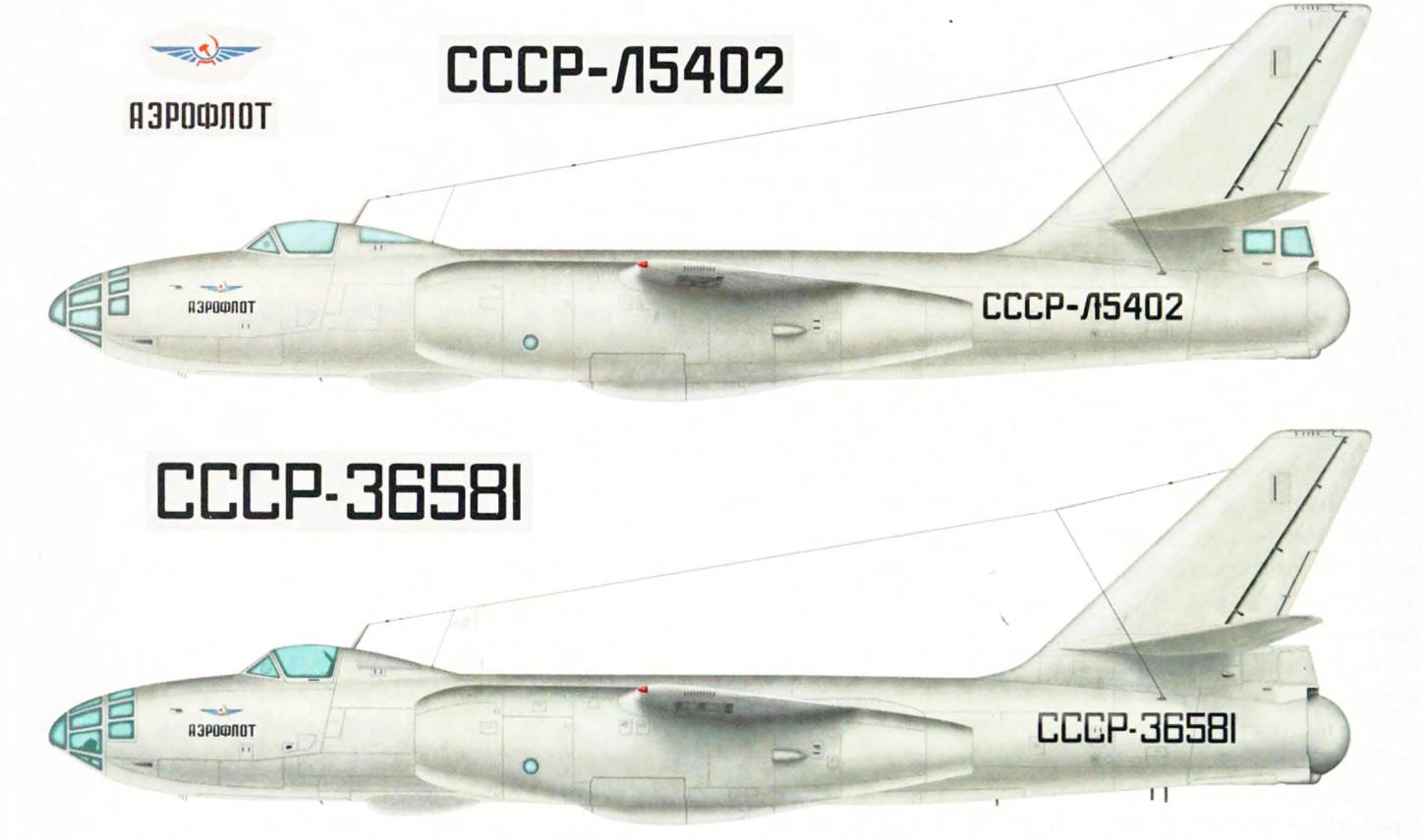
Aeroflot crews discuss the day's flight plan in front of an IL-20 mailplane whose starboard engine is being worked on.

Below: The second IL-20 delivered to Aeroflot, registered CCCP-Л5402 (i.e., SSSR-L5402 in Cyrillic characters).

Bottom: IL-28ZA CCCP-36581, Far Eastern Civil Aviation Directorate/Khabarovsk United Air Detachment.

trainer. Together with the so-called Tu-104G (*groozo**voy*** – cargo, used attributively), which was really a demilitarised Tu-16 *Badger-A* bomber, the IL-20 enabled Aeroflot to develop a training programme which speeded up the introduction of the first Soviet jet airliner, the Tu-104 *Camel*.

As a point of interest, much later, when the civil IL-20s had been retired, the designation was used for a third time – and again for a military aircraft. This time it was a well-known derivative of the IL-18D airliner – a long-range PHOTINT/ELINT aircraft (NATO *Coot-B*).



Aeroflot personnel carry sacks of mail from an IL-20 with the pre-1958 style registration CCCP-Л5402 (c/n 54005777). Typically of most IL-20s, this aircraft wears an overall silver finish with just the Aeroflot titles and logo but no cheatline.

IL-28ZA weather reconnaissance aircraft

The majority of the demilitarised *Beagles*, however, served a different purpose, and these were second-hand aircraft. On 23rd February 1959 GKAT issued an order concerning the development of the IL-28ZA weather reconnaissance aircraft (*zondi**rov**shchik atmos**fe**ry* – 'atmosphere sampler') for civil aviation needs. Since the military had already begun retiring the IL-28 in line with Khrushchov's defence cuts, a considerable number of *Beagles* were stripped of armament and transferred from the Air Force and the Naval Aviation to Aeroflot, which had them converted to IL-28ZA configuration. Such aircraft were fitted with SK1-60 containers (*spetsi**ahl'**nyy kon**tey**ner* – special container) in the bomb bay housing air sampling equipment for their new role. The work was done by the Ministry of Defence's 256th Aircraft Repair Plant in Siauliai, Lithuania.

IL-28ZA CCCP-36589 with a cheatline. The scrap views show it with the radar still in place.

This *Beagle* with the post-1958 registration CCCP-36584 and no radar is an IL-28ZA weather reconnaissance (air sampling) aircraft. Note the cheatline with 1960s-style 'feathers' and the bi-colour Aeroflot logo with blue wings and red hammer-and-sickle. Curiously, none of the IL-20s or IL-28ZAs carried the Soviet flag on the tail.

Target-towing versions

Soviet IL-28/IL-28R target tug (IL-28BM)

Two versions (the IL-28 *sans suffixe* and the IL-28R) were widely used as target tugs – both for testing new anti-aircraft artillery systems and for training AAA crews and fighter pilots. The special equipment for this mission depended on the aircraft's variant. The basic bomber was outfitted with a BLT-5 winch (*booksi**rov**ochnaya le**byod**ka s toor**bin**oy* – [ram-air] turbine-driven towing winch) installed in the bomb bay and worked with a winged target of several models – the 77BM-2 (*booksi**roo**yemaya mi**shen'*** – towed target), 77BM-2M or PM-3Zh (***plah**ner-mi**shen'*** – glider-type target). The latter model was developed by OKB-487 under Grigoriy I. Bakshayev. The PM-3Zh had a wide-chord tail swept back 45°, narrow-chord unswept wings placed well aft

An IL-28 converted into a target tug with a BLT-5 winch and a short towing boom 'cleans up' as it takes off and climbs away.

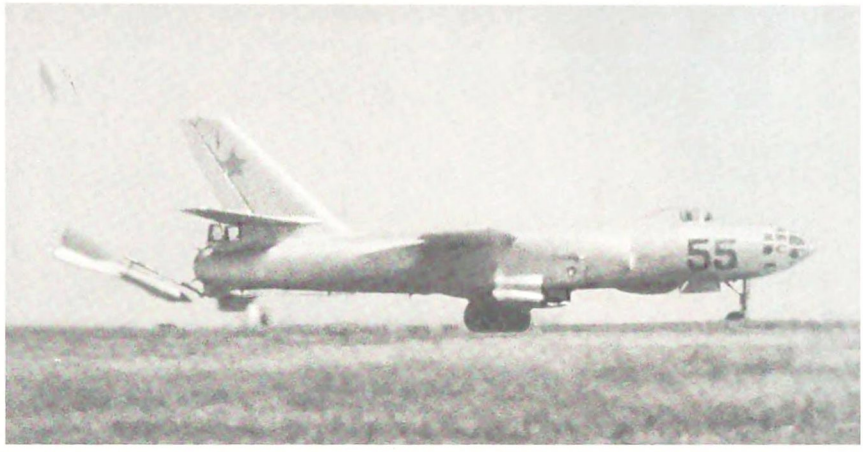
and a tricycle landing gear with small wheels. In contrast, the bulky 77BM-2 had anhedral delta wings and a delta fin of the same size, both with about 60° leading-edge sweep, plus a tricycle gear.

The towing cable passed through a conduit on the rear fuselage underside and over a short hinged towbar (a rigid link) to which the target was attached for take-off and landing, permitting operation from both paved and unpaved strips. After take-off the GRO, who was responsible for the target-towing equipment, paid out the cable to a length up to 2,500 m (8,200 ft) long. The 'aircraft plus target' combination was known in Russian terminology as ***a**ero**po**yezd* (air train)!

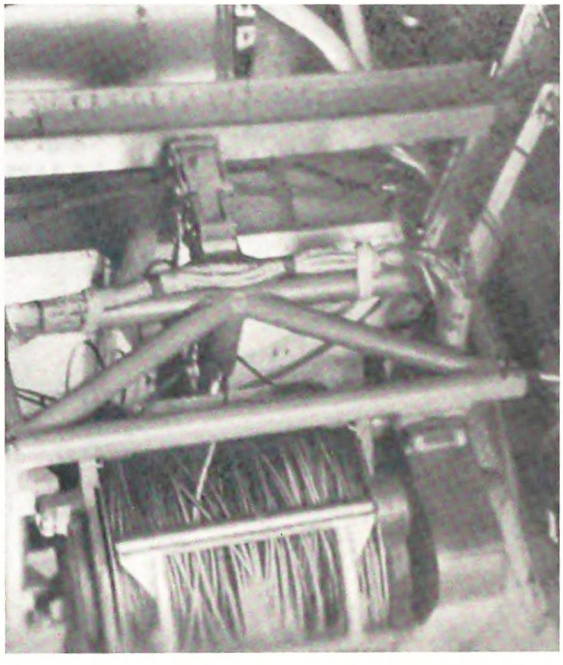
In contrast, IL-28Rs outfitted for target-towing had a BLM-1000 (*booksi**rov**ochnaya le**byod**ka mi**shen**naya* – target-towing winch) or BLM-1000M electric winch and a long rigid link, working with the same types of targets. The installation of target-towing equipment did not seriously affect the aircraft's CG position, which stayed well within the prescribed limits. Both of the single-point target-towing versions are sometimes called IL-28BM (*booksi**rov**shchik mi**shen**ey* – target tug), but this designation is unofficial; the pilot's manual calls them 'aircraft equipped for towing such-and-such targets', without any suffixes.

The IL-28 bomber outfitted for target-towing had a gross weight of 20,100 kg (44,310 lb); in the case of the IL-28R it was 19,822 kg (43,699 lb). The field performance of aircraft thus configured enabled them to operate with targets from concrete airstrips at least 1,800 m (5,900 ft) long. At a gross weight of 22,207 kg (48,957 lb) the IL-28R could operate with targets from concrete airstrips at least 2,300 m (7,545 ft) long.

The target was hooked up either directly on the flight line or at the 'last chance' checkpoint before the



This IL-28 target tug coded '55 Blue' has a target looking like a big bomb attached to the towing boom for take-off.



The BLT-5 target-towing winch of an IL-28 equipped as a target tug.

An IL-28 target tug based on the bomber version flies with a PM-3Zh target in tow.

Performance of the IL-28/77BM-2M combination and the IL-28R/PM-3Zh combination

	IL-28 + 77BM-2M	IL-28R + PM-3Zh
Take-off weight, kg (lb)	20,100 (44,310)	19,800/22,200 (43,650/48,940) *
Landing weight, kg (lb)	15,000 (33,070)	15,500 (34,170)
Fuel supply, litres (Imp gal)	7,990 (1,757.8)	9,550 (2,101)
Maximum indicated airspeed with target in tow, km/h (mph)	700 (435)	540 (335)
Indicated airspeed when paying out cable, km/h (mph)	350 (217)	320 (198)
Indicated airspeed when rewinding cable, km/h (mph)	350 (217)	310/320 (192/198)†
Minimum indicated airspeed with target in tow, km/h (mph)	300 (186)	300 (186)
Maximum crosswind speed (at 90° to direction of flight) on take-off with target in tow, m/sec (kts)	10 (20)	7 (14)
Climb time, minutes:		
to 1,000 m (3,280 ft)	3.5-4.0	4.0
to 4,000 m (13,120 ft)	9.75-10.25	10.75
to 8,000 m (26,250 ft)	23.75-24.0	27.25
to 10,100 m (33,140 ft)	n.a.	55.0
to 10,900 m (35,760 ft)	57.0	n.a.
Range, km (miles):		
at 10,000 m (32,810 ft) and 620 km/h (385 mph)	845 (524)	n.a.
at 8,000 m and540 km/h (335 mph)	n.a.	1,140 (708)
Maximum range, km (miles)	1,475 (916)	1,555 (965)
Endurance at 8,000 m and 540 km/h	n.a.	2 hr 07 min
Maximum endurance	2 hr 44 min	3 hr 11 min
Target unstick speed, km/h (mph):		
on paved runway	240 (149)	259/274 (160/170) †
on unpaved runway	240 (149)	254/268 (157/166) †
Target take-off run, km/h (mph):		
on paved runway	1,400 (4,590)	1,610/2,150 (5,280/7,050) †
on unpaved runway	1,700 (5,580)	1,720/2,300 (5,640/7,545) †
Take-off distance to a target altitude of 25 m (82 ft), m (ft):		
on paved runway	2,280 (7,480)	2,460/3,220 (8,070/10,560)
on unpaved runway	2,650 (8,690)	2,600/3,400 (8,530/11,150)
Target landing speed, km/h (mph):		
on paved runway	200-205 (124-127)	220-225 (136-139)
on unpaved runway	200-205 (124-127)	220-225 (136-139)
Landing run with target attached, km/h (mph):		
on paved runway	1,500 (4,920)	1,620 (4,920)
on unpaved runway	1,200-1,300 (3,940-4,265)	1,250-1,350 (4,100-4430)
Landing distance from 25 m with target attached, m (ft):		
on paved runway	2,200 (7,220)	2,400 (7,870)
on unpaved runway	1,950 (6,400)	2,000 (6,560)

Notes: * Normal TOW/maximum TOW; † In level flight/during descent

aircraft lined up for take-off. Once the IL-28BM was airborne, the lock connecting the target to the towbar was released and the cable was paid out to an initial length of 20-25 m (65-82 ft) for the PM-3Zh, or 70 m (230 ft) for the 77BM-2/77BM-2M. The flight speed limit with a towed target depended on the target type because the 77BM-2 and the PM-3Zh had different structural strength. Before landing the cable was rewound and the target was locked into place.

Apart from the ones mentioned above, several other targets were tried on the IL-28 target tugs. The M-111 semi-rigid target looked rather ephemeral, consisting of a T-shaped bar with a weight at the bottom and two fabric banners, one of which was vertical, the other horizontal and more than twice as big. The target proved unsatisfactory because of its too low conspicuity – you cannot take aim at something you cannot spot!

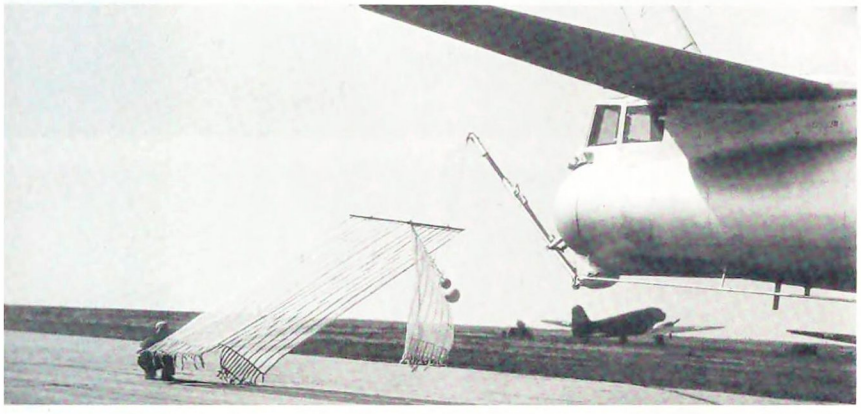
The M112M towed target passed repeat trials at GK NII VVS in the summer of 1962. It had a similar semi-rigid design and was also rejected for exactly the same reason – its visual signature and radar signature were too low.

Left: This IL-28 is seen towing an M-111 banner-type target.

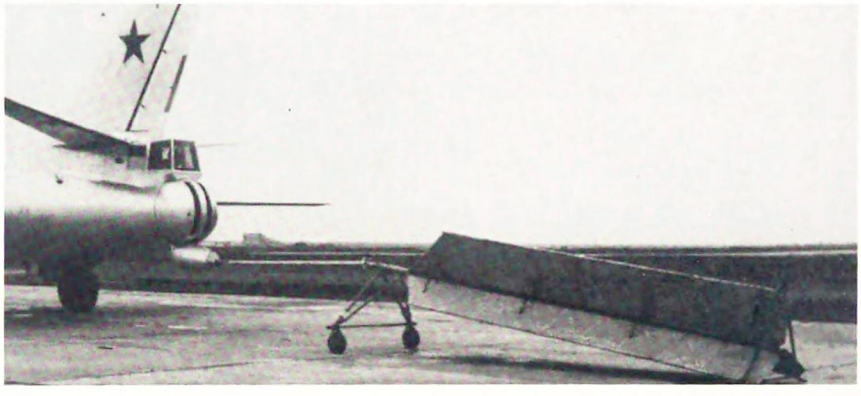
Below left: The M-111 hooked up to the towing boom of an IL-28R tug (c/n 5901211).

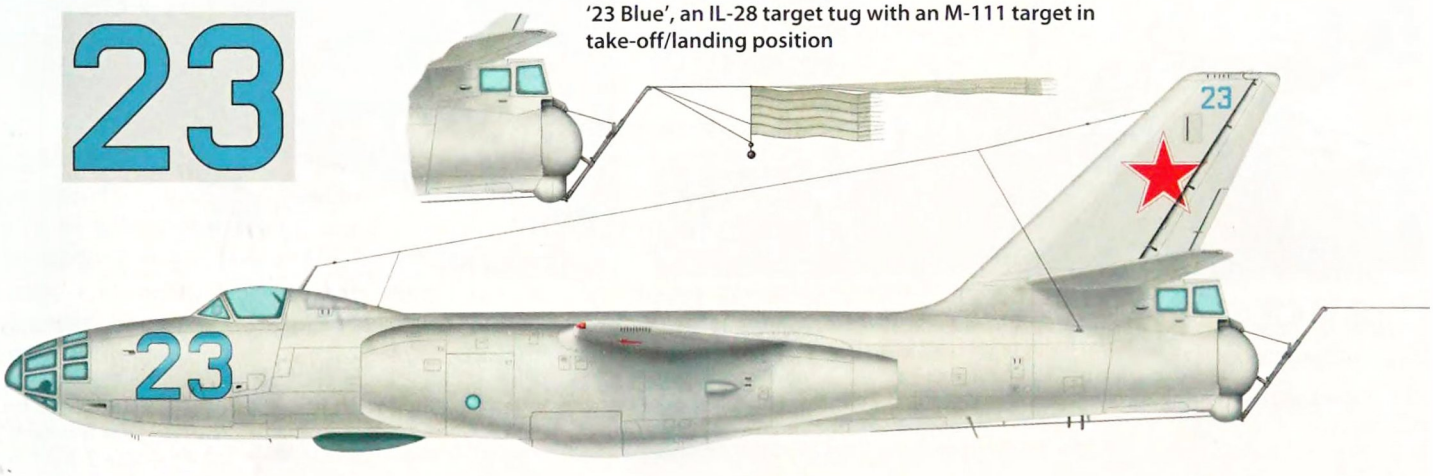
Below: An IL-28 target tug lands after a sortie with an M-111 showing signs of 'battle damage'.

Below: The MSV-51 experimental target with its take-off dolly.

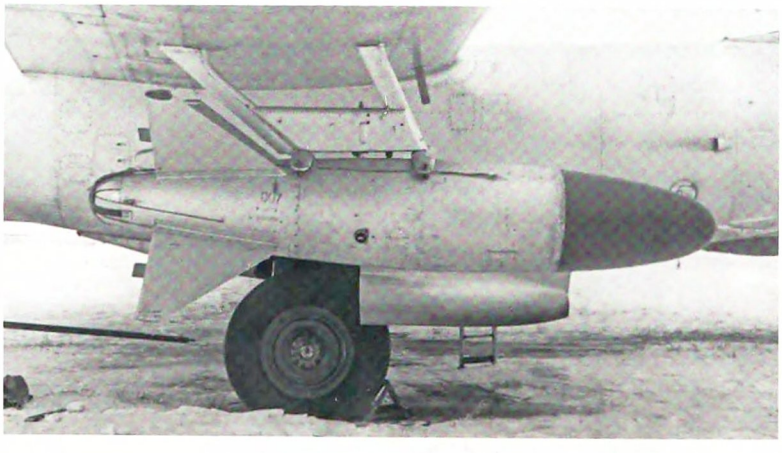


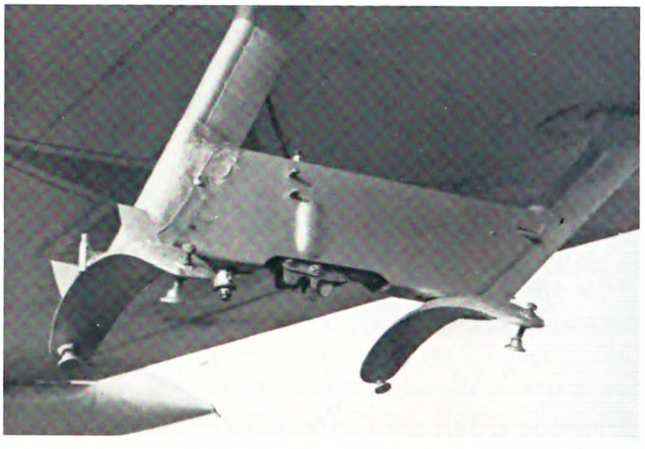
The MSV-51 experimental target (*mi**shen'** so stabili**zah**tsiyey vra**shche**niyem* – spin-stabilised target, 1951 model) was developed by the Navy's NII-15 for training fighter pilots. It consisted of three long fabric-covered truss-type fins set at 120° to each other in head-on view, each fin having an angled 'rudder' at the trailing edge to impart a spinning motion; to give the required stiffness the fins were connected by four sets of struts forming equilateral triangles and equally distributed along the target's length. The whole contraption was towed on the usual boom; for take-off a frame with a pair of small wheels was placed under the





'23 Blue', an IL-28 target tug with an M-111 target in take-off/landing position



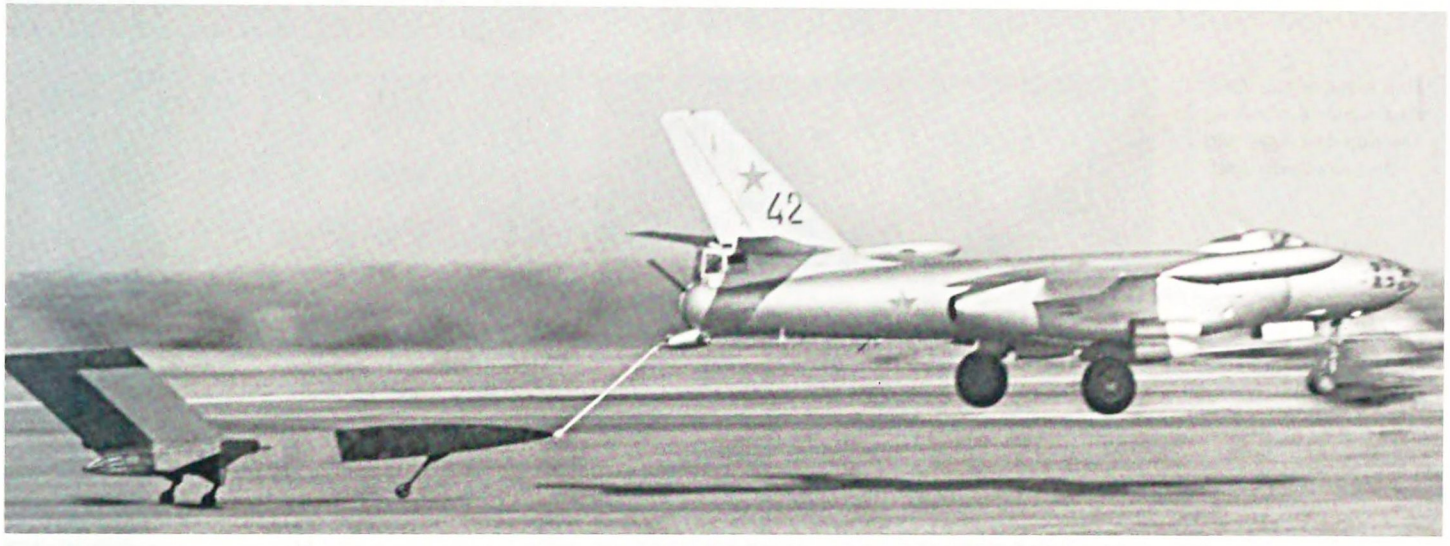


Top: '01 Red', the IL-28RBN 'three-point' target tug prototype, with two PM-6 targets attached during trials

Centre: The same aircraft with two PM-6s under the wings and a PM-3Zh target in tow.

Above left: Close-up of a PM-6 droppable target under the wing of an IL-28RBN.

Above: This shot shows the design of the IL-28RBN's pylons used for carrying PM-6 targets.



front end, falling away as the target lifted off. After initial trials with a Tu-2 acting as the tug, the MSV-51 was tested with the IL-28 and apparently deemed unsatisfactory.

One more unidentified target looked like a bomb with very long fins, resembling World War I bombs which were dropped manually. It was attached directly to the towing boom for take-off.

IL-28RBN target tug

In addition to towed targets, some IL-28Rs equipped for target-towing were able to carry PM-6R or PM-6G gyrostabilised targets under the wings. The PM-6 (*izdeliye* 106) targets looking rather like fat bombs with red-painted noses and overgrown fins were carried on special pylons attached on two forward-swept V-struts between ribs 17/18 and featuring two pairs of sway braces. Aircraft thus equipped were designated IL-28RBN (*raz**ved**chik/booksi**rov**shchik-no**sit**el'* – reconnaissance aircraft-cum-target tug/target carrier) as a reference to this 'three-point' arrangement. Empty weight with the extra pylons was increased to 13,839 kg (10,509 lb).

The targets were aimed using the optical sight or radar; in an emergency they could be dropped by either the pilot or the navigator. The delivery system spun up the targets' stabilising gyros, using power from the aircraft's electric system, and released the targets singly or simultaneously at a preset altitude between 2,300 and 8,000 m (7,545-26,250 ft) at true airspeeds of 450-590 km/h (279-366 mph). From 3,000 m (9,940 ft) up the drop altitude increased in 500-m (1,640-ft) increments. The PM-6 was equipped with a smoke tracer to increase the visual signature as it dived at an angle of 30°, 35° or 40°. It was provided with a recovery parachute and pop-out sprung 'feet' to absorb the landing impact.

The IL-28RBN prototype coded '01 Red' was converted from a standard IL-28R in keeping with a

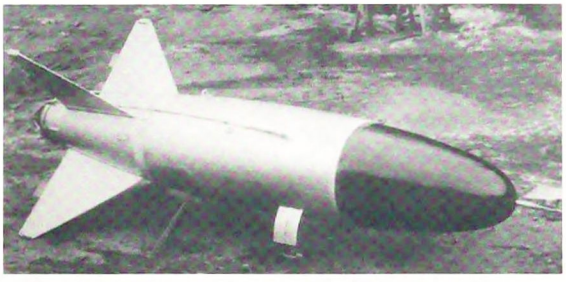
Top: '50', an operational IL-28RBN conversion, with two PM-6s attached.

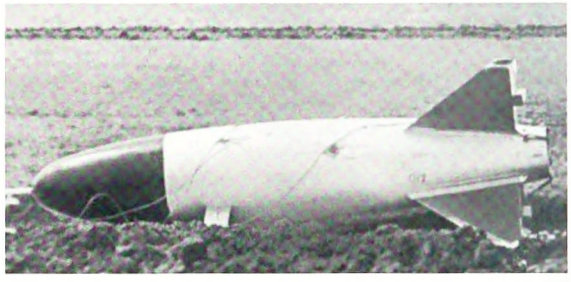
Above: IL-28R '42 Blue' equipped for target-towing, takes off with a PM-3Zh target hooked up to the rigid towbar; it will be released and the cable unwound as the aircraft climbs. Note that the target lifts off after the aircraft does; on landing it's vice versa. The position of the tactical code on the tail is also noteworthy.

Right: An IL-28RBN drops a PM-6 target from the port wing pylon; the starboard target is still in place.

Far right: The gunners have missed: an intact PM-6 descends under its recovery parachute.

Two views of the PM-6 after landing, showing the pop-out 'legs' and the parachute lines.



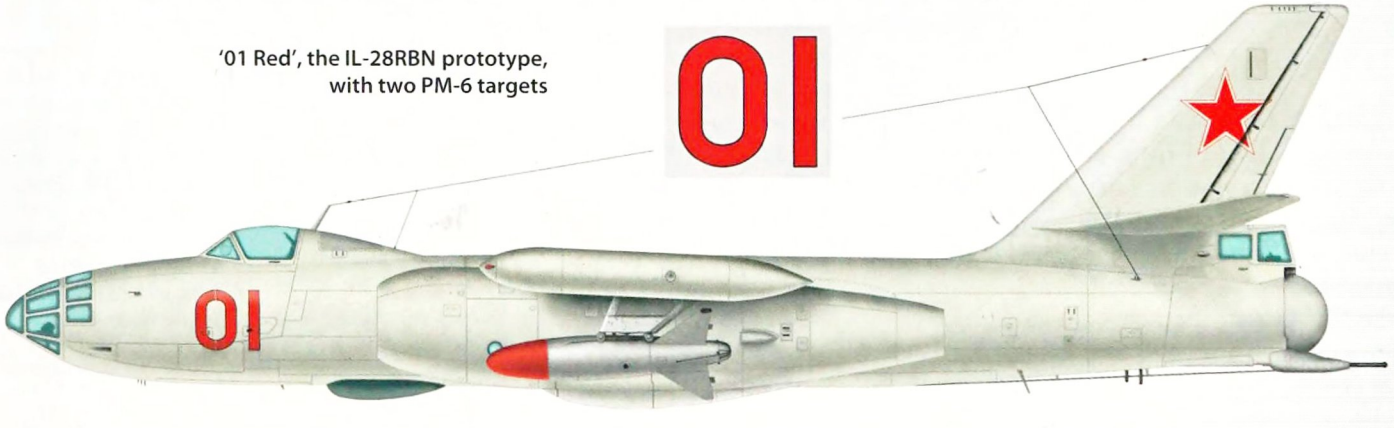


Council of Ministers directive dated 28th March 1956. The tests were held in the Transcaucasian Military District in the spring of 1958; G. M. Khalmuratov was the aircraft's project test pilot, with S. P. Shkvorets as engineer in charge. 'Production' aircraft modified to this configuration are known to have served with the Soviet Air Force's 35th OBAE (*ot**del'**naya booksi**rov**ochnaya **a**viaeskad**ril'**ya* – Independent Target-Towing Squadron) in the 1970s. With two PM-6 targets the service ceiling was limited to 9,600 m (31,500 ft) and the take-off run increased by 300 m (980 ft). Maximum level speed with the PM-6 targets was 600 km/h (372 mph) IAS or Mach 0.78.

IL-28 target tug – Finnish version

The Finnish Air Force's IL-28Rs were mostly used as target tugs and were fitted with Soviet BLM-1000 winches, working with both Soviet and western targets. However, the first *Beagle* delivered to Finland, a Moscow-built bomber serialled NH-1 (c/n 53005706), had a simpler version of the target-towing equipment. The cable drum mounted in the bomb bay was

'01 Red', the IL-28RBN prototype, with two PM-6 targets



Performance of the IL-28RBN		
	with two PM-6 targets	with two PM-6s + PM-3Zh *
Speed, km/h (mph):		
at 2,000 m (6,560 ft)	728/722 (452/448) †	606/600 (376/372)†
at 4,000 m (13,120 ft)	734/728 (455/452)	612/605 (380/375)
at 6,000 m (19,685 ft)	737/728 (457/452)	605/588 (375/365)
at 8,000 m (26,250 ft)	726/708 (450/439)	566/530 (351/329)
at 10,000 m (32,810 ft)	690/610 (428/378)	–
Service ceiling, m (ft)	11,600/10,500 (38,060/34,450)	10,000/8,700 (32,810/28,540)
Rate of climb, m/sec (ft/min):		
at 2,000 m	14.6/12.5 (2,873/2,460)	12.6/10.6 (2,480/2,086)
at 5,000 m (16,400 ft)	8.4/7.0 (1,653/1,377)	6.8/4.8 (1,338/944)
at 8,000 m	4.4/3.2 (866/629)	2.5/1.2 (492/236)
at 10,000 m	1.6 (314)/–	–
Climb time, minutes:		
to 5,000 m	7.2/8.5	8.8/11.0
to 8,000 m	14.5/17.8	11.5/30.0
to 10,000 m	23.4/33.6	–
Range, km (miles):		
at 5,000 m	1,046/1,644 (649/1,021)	715/1,182 (444/734)
at 7,000 m (22,965 ft)	1,144/1,855 (710/1,152)	774/1,261 (480/783)
at 9,000 m (29,530 ft)	1,231/1,936 (764/1,202)	828 (514)/–
Endurance:		
at 5,000 m	2 hrs 02 min/3 hrs 16 min	1 hr 38 min/2 hrs 39 min
at 7,000 m	2 hrs 06 min/3 hrs 24 min	1 hr 35 min/2 hrs 33 min
at 9,000 m	2 hrs 10 min/3 hrs 21 min	1 hr 35 min/–

* Towed with the cable paid out to 2,500 m (8,200 ft)

† In each case, the figures before/after the slash are for normal AUW/maximum AUW respectively

equipped with a simple friction brake and could only pay out the cable, not rewind it. To this a sleeve-type target was attached; it was jettisoned together with the cable before landing.

IL-28 target tug – East German version

The East German IL-28s converted into target tugs differed from their Soviet counterparts, as no 'rigid' targets were used. A drum holding 2,000 m (6,560 ft) of steel cable was mounted on the standard bomb cradles in the bomb bay. To this a fabric 'sock' 8 m (26 ft) long and 1 m (3 ft) in diameter was attached; it was neatly rolled up and suspended from the bomb cradles before flight. A small roller was mounted aft of the bomb bay to stop the cable from scuffing the fuselage skin as it paid out. Some types of anti-aircraft guns (including the S-60) were radar-directed, so aluminium cones were inserted into the 'sock' to provide an adequate radar signature. All armament was usually removed.

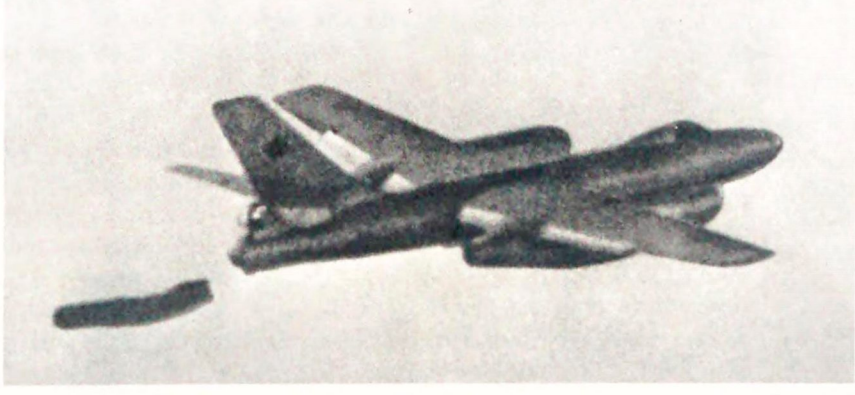
Prior to entering the shooting range the pilot set the flaps 20° and reduced the speed to 280 km/h (174 mph) to prevent the target from being ripped apart or torn off by the slipstream as it unfolded. The navigator then released the target, which unwound the cable as it deployed; the drum was fitted with a centrifugal brake to make sure the cable unwound smoothly. Two or three minutes later the target was fully deployed, the observer in the gunner's station monitoring it.

When the sortie was completed the cable and target were jettisoned, usually by means of a pneumatic release mechanism, but the cable could also be cut by a pyrotechnical guillotine in case of malfunction. After landing the cable was rewound and ready for another mission; the target could also be reused, unless it was totally shot to shreds.

IL-28 target tug – Romanian versions

Two of the Romanian Air Force's IL-28Rs (433 Red and 443 Red, c/ns 41433 and 41443) were modified for

A poor but interesting shot of an East German Air Force IL-28 towing a sleeve-type target.



target-towing duties, apparently by URA Bacău (*Uzina de Reparații Avioane* – Bacău Aircraft Repair Plant). This was later renamed IAv Bacău (*Intreprenderia Avioane* – aviation enterprise, because it was by then not only a repair facility but also an aircraft manufacturer); now it is known as Aerostar SA. Details of the conversion are not known.

Later, when the IL-28Rs had been retired as time-expired, at least one Romanian Air Force Harbin B-5 (Chinese-built IL-28, see below) serialled 307 Red (c/n 511710307) was converted for target-towing duties as well. This time the aircraft featured mission equipment developed by the Swedish company Air Target Sweden AB. An MBV7S Mk 3 target-towing winch was installed in the bomb bay, with a faired cable outlet amidships; the cable was 4,500 m (14,765 ft) long. The winch worked with a KR-45-430 sleeve-type target equipped with an AS-131SC acoustic miss distance sensor; the target was hooked up under the fuselage before flight. The B-5 target tug was eventually lost in a landing accident on 2nd August 2000.

IL-28 target tug – Polish versions

The Polish Air Force and Polish Navy used a number of IL-28s (including at least one IL-28U) for target-towing duties after retiring its Tu-2 target tugs in 1957. The aircraft were modified locally. At first the mission equipment was rather basic, allowing them to work with a sleeve-type target or the indigenous Gacek ('bat' in Polish) glider-type towed target. The early version, which in the case of the naval machines was installed by the Naval Aviation's field aircraft repair shop (PWL – *polowy warsztat lotniczy*) in Gdynia, had a drum holding 1,500 m (4,920 ft) of steel cable, which was equipped with a pneumatically operated brake to prevent overspeeding and a mechanical lock; thus, the cable could be paid out to the desired length but could not be rewound. The mechanism was controlled by the GRO. With the drum rotating at 750 rpm, it took as much as 25 minutes to pay out the cable fully. Landings with the target in tow were not practiced; after the target run the aircraft would descend over the airfield and the GRO would operate the cable cutter at the right moment, the Gacek gliding to a safe landing.

Later, in 1970, some aircraft were retrofitted with the much more advanced R-1500 and WH-1500 winches (*winda holownicza* – towing winch, the figures indicate the towing cable length); these were designed by the Polish Air Force's WZL-2 aircraft repair plant (*Wojskowe Zakłady Lotnicze* – military aircraft plant) in Bydgoszcz, which also did the conversion jobs. Both types of winch were installed at the front end of the bomb bay and powered by an electric motor which functioned as a generator when the towing cable was being paid out, providing the required braking force; the electric power thus generated was dissipated by an electric heater mounted conformally on the bomb bay doors at the front and cooled by the slipstream. The towing cable exited the bomb bay at the rear, passing over a horizontal roller in the R-1500 installation; in the WH-1500 installation this was augmented by a pair of vertical rollers.

With the new winches, the IL-28 target tugs originally worked with two types of sleeve-type targets 6 m (19 ft 8½ in) or 12 m (39 ft 4⅞ in) long; they had a cylindrical shape with a diameter of 80-90 cm (2 ft 7½ in to 2 ft 11⅞ in), with a closed rear end, and were sewn from square-shaped pieces of white cloth to facilitate 'battle damage repair'. The type of sleeve and the operational technique depended on the 'adversary'; for air-to-air gunnery the short version was towed on a 750-m (2,460-ft) length of cable, whereas for training AA gunners the long version was used and the cable was paid out to its full length. A third version was added later; it was orange-coloured and shaped like a cropped cone of 6 m length with an open rear end; this was because the previous versions were prone to bursting. Different fighter pilots or gun crews used rounds coated with different oil-type paints for hit visualisation, making it possible to see who scored a hit and who missed. Unlike the first version of the towing equipment, where the rolled-up sleeve was either stowed in the bomb bay or suspended under the rear fuselage prior to release, the sleeve-type targets used with the new winches were towed full time.

As the installation was rather complex, WZL-2 held special training courses for the GROs. Again, it was standard operational procedure to cut the towing cable before landing to avoid dragging the target along the runway; however, since the cable was rewound before landing, only a small piece of it was wasted.

Another type of target used by the Polish IL-28 target tugs was the C-7 bomb-type target (C stands for *cel* – 'target' in Polish. This was again used for training both fighter pilots and the AA gun crews of Polish Navy ships.

IL-28M target drone (IL-28M-1, IL-28M-2, M-28)

Besides towing targets, many *Beagles* ended up as targets themselves! In the late 1950s many decommissioned IL-28s were converted into high-speed target drones designated IL-28M (*mi**shen'*** – target) and used for testing new surface-to-air missile (SAM) systems. The idea was first floated in 1952; development of the target drone version was brought about by the Semyon A. Lavochkin's OKB-301 which, in 1950, started design work on the V-300 missile for the first Soviet practical SAM system, the S-25 *Sos**na*** (Pine tree, later renamed ***Ber**kut* – Golden Eagle; NATO SA-1 *Guild*) created under the overall responsibility of KB-1. The S-25 was intended for point defence of important

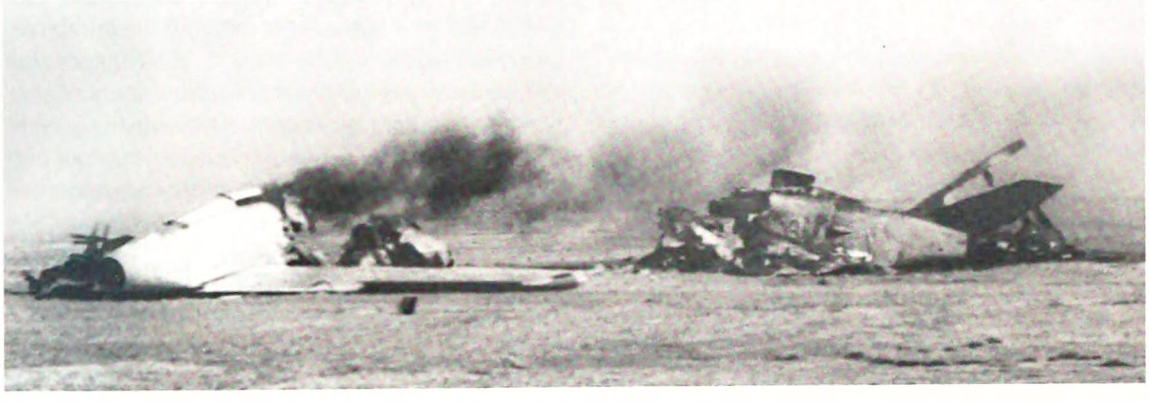
targets, such as major industrial centres. It was designed to destroy aircraft with a radar cross-section (RCS) similar to that of the IL-28.

Initially decommissioned *Beagles* earmarked for the drone role were given a 'brush-up' by the manufacturer to make sure a mechanical failure would not prevent the aircraft from fulfilling its final mission. Then a pilot would take the doomed bomber into the air, climb to the required altitude, engage the autopilot and eject when told to do so by ground control. GK NII VVS test pilot Fyodor D. Bogdanov made 31 such flights in 1952-57, ejecting at 12,500 m (41,010 ft). However, early-model ejection seats often caused injuries to the ejectees, a fact which triggered the development of the radio-controlled version; the appropriate Council of Ministers directive appeared in March 1956.

The remote control system enabled the IL-28M to take off, climb to cruise altitude, make manoeuvres and land if the drone was lucky enough to survive a SAM attack. Two varieties designated IL-28M-1 and IL-28M-2 existed. Quite often, however, the converted bombers were referred to as M-28s. The use of the generic 'M-for-target-drone' prefix instead of the proper type designator was common in the Soviet Air Force; cf. M-15 instead of MiG-15M *Fagot-B*, M-17 instead of MiG-17M *Fresco-A/C*, M-21 instead of – well, no, not MiG-21M *Fishbed-J*, which was *not* a drone.

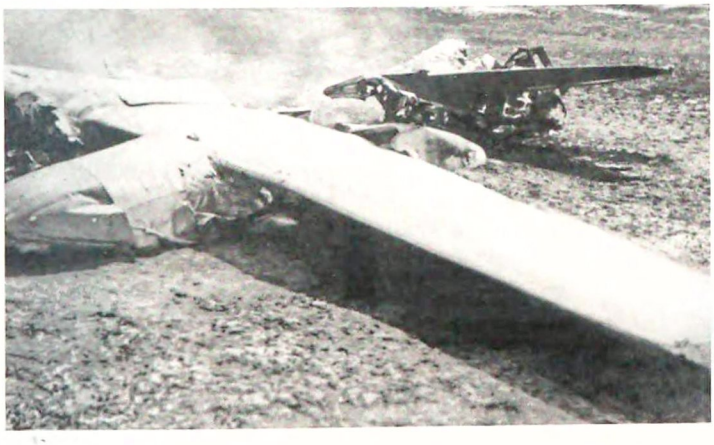
Lots of V-300s were fired at IL-28Ms and similarly modified Tu-4s during the testing of the S-25 and S-25M SAM systems. For example, three missiles in the *izdeliye* 207 version (test launches Nos. 188-190) were fired at an IL-28M designated as 'drone No.1' on 24th September 1953. Another three-missile salvo (test launches Nos. 197-199) took place on 30th September against an IL-28M designated as 'drone No.2'. Test launches Nos. 210-214 of the *izdeliye* 207 against an IL-28M on 7th October 1953 were unsuccessful – the target got away unscathed. Test launches Nos. 215 and 216 against another IL-28M that same day were more successful.

Another version of the SAM, the *izdeliye* 207A, was tested between June 1953 and November 1954; state acceptance trials began in September 1953. For instance, three launches against IL-28Ms were made in October 1953, two of the missiles having V-196 shaped-charge warheads (apparently these were test launches Nos. 10 and 11 against 'drone No.5'). The V-196 showed disappointing performance – it did not guarantee destruction of the target if the proximity fuse detonated the missile within 75 m (250 ft) of it. Therefore the third missile (test launch No.12, apparently against 'drone No.6') had an NOD-207A warhead ([*boye**va**ya chast'*] *na**prav**lenno-os**kol**ochnovo **dey**stviya* – directional fragmentation warhead for *izdeliye* 207A) which ensured destruction of the target even if the distance was as much as 84 m (275 ft). Launches Nos. 13 and 14 against 'drone No.7' followed on 1st November and launch No.65 on 1st September 1954. The target drones



Left and below: The burning wreckage of an IL-28M target drone shot down by a V-300 SAM in 1954.

Below left: Another IL-28M destroyed by a V-300 during trials in 1953; note the dark-coloured cowlings.



flew at 9,500-20,000 m (31,170-65,620 ft) and up to 35 km (21.7 miles) from the launch site. All of them were either destroyed or substantially damaged (and finished off by fighters), the missiles' accuracy being within 7-58 m (23-190 ft). The *izdeliye* 207A entered production with the NOD-207A warhead in 1955.

Yet, such SAMs were effective against single targets but no good against large bomber formations. This was first pointed out in December 1954 by Col.-Gen. Konstantin P. Kazakov, Commander of the 1st Special Mission Air Defence Army. He suggested developing a SAM with a small nuclear warhead; the idea found support, and on 22nd March 1955 the Council of Ministers issued a directive tasking the Lavochkin OKB and the Ministry of Medium Machinery (MSM – *Mini**ster**stvo **sred**nevo ma**shin**ostro**yen**iya*) responsible for the Soviet nuclear programme with creating such a weapon. This was duly developed as *izdeliye* 215, yet another version of the V-300 series. The S-2 nuclear charge was developed by MSM's KB-25 headed by Nikolay L. Dookhov. On 19th January 1957 an *izdeliye* 215 SAM was tested successfully, shooting down two IL-28M drones in one launch – an unprecedented event. The lead aircraft was flying at 10,500 m (34,450 ft), with the 'wingman' slightly lower and some way off; the missile detonated 700 m (2,300 ft) from the flight leader and both aircraft were destroyed. In production form the nuclear-tipped SAM was designated *izdeliye* 207T.

IL-28M drones were also used in the trials of the 2K12 Koob (Cube; NATO SA-6 *Gainful*) mobile SAM system developed by GKAT's OKB-15 in 1958-65. In some of the missions they made vertical manoeuvres, pulling 1-1.2 Gs. On at least one occasion the drone was preceded by five IL-28PPs which set up a carpet of chaff – which did not prevent the missile from hitting the target. However, five or seven fighters were loitering nearby, ready to shoot the drone down in the unlikely event that it survived the missile attack and made off.

In some cases the IL-28M was outfitted for towing a 77BM-2M target in order to simulate a bomber formation. Imagine a target towing a target! (...towing a target towing a target etc. etc. – why not set up a really big formation?) Jokes aside, this brings to mind towed decoy systems such as the Raytheon AN/ALE-50 or the BAe Systems ALE-55. The towed target was modified for the occasion, being fitted with a Luneburg lens to increase its RCS to that of a bomber. The IL-28M took off with the towing cable already unwound to the required length, as there was no GRO to work the winch after take-off. The first attempt to implement this technique failed because the aircraft was flying too slowly; the towed target dipped below the IL-28's flight level and snagged an obstacle, veritably pulling the target tug out of the sky. On the second try everything worked. At first the missile's seeker head perceived the 'air train' as a single target but then identified the IL-28M and the 77BM-2M as two separate targets, and the missile went for the *Beagle*, destroying it.

IL-28 – Finnish photo mapping conversion

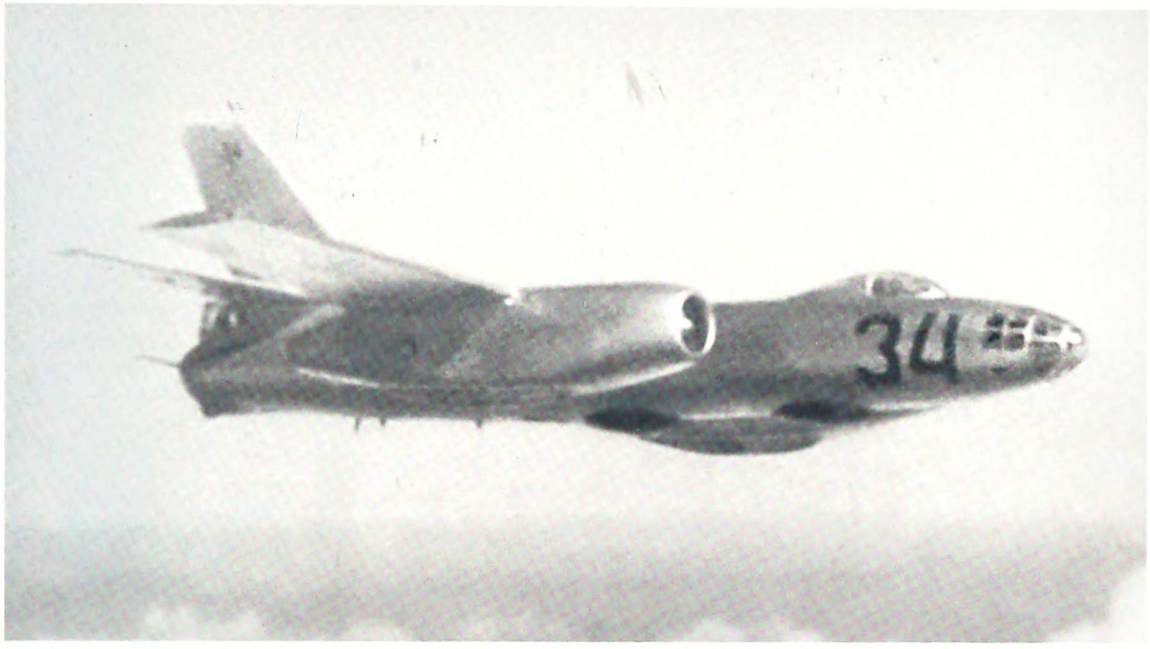
In the late 1950s the Topography Department and the Land Survey Administration of Finland started making detailed maps of the entire country. However, the scope of work was severely limited by capabilities of the Finnish Air Force's then-current photo survey aircraft and the sensitivity/grain parameters of the available photo film, which furnished images suitable for maps of no more than 1:30,000 scale.

High-resolution fine-grain Kodak film became available in Finland in the early 1960s, but there was still no camera platform to do it justice. Therefore, as soon as the Finnish Air Force received its first *Beagle*, the abovementioned bomber (NH-1, c/n 53005706), in January 1960 it was earmarked for modification as a high-altitude photo mapping aircraft at the initiative of Lt.-Col. Karl Löfström and the Finnish Defence Topography Department's aerial photo mapping section chief Heikki Raevaara. The Finns resorted to such a conversion because the first of an eventual three IL-28Rs was not delivered until June 1961 and the national mapping project had high priority.

The camera installation was developed by the Finnish company Valmet, which undertook the conversion job at Kuorevesi in the winter of 1960. A Zeiss Pleogon RMKA 15/23 camera was installed on a mount.with an electric servo motor in the bomb bay, giving images suitable for maps of 1:61,000 scale. The Finns did not care for the idea of leaving the bomb bay doors open during the photo run because this created extra drag, reducing endurance. Hence a camera port closed by a sliding door was built into the bay doors; this feature was designed by Heikki Raevaara and Capt. Touko Aaltonen.

The aircraft made its first post-conversion test flight on 11th January 1961 with Pertti Hälikkä at the controls. The first test results with the camera installation were unsatisfactory; hence a mercury-based sensor was added to the camera servo circuit to adjust the optical axis automatically as the aircraft pitched up or down. The first test flight in this configuration took place on 14th July 1961, with good results; the aircraft was flown by pilot Seppo Kärkkäinen and navigator/camera operator Unto Pelkonen.

Upon completion of the tests IL-28 NH-1 became operational in the spring of 1962. The original Zeiss camera was later replaced by a Wild camera. Photo runs were flown in a shuttle pattern at 9,200 m (30,180 ft) so that the strips covered during each 'tack' overlapped by approximately 30%. The lenses were routinely cleaned with alcohol before each sortie to prevent dirt from impairing the photo quality.



A Soviet IL-28RTR coded '34' shows off the additional ventral teardrop fairing associated with ELINT gear.

IL-28RTR ELINT aircraft

Apart from the IL-28R PHOTINT aircraft, the *Beagle* also had an electronic intelligence (ELINT) version designated IL-28RTR (***rah****diotekh****nich****eskaya raz****ved****ka* – ELINT). This version is a bit controversial, as the designation has been applied to two rather different configurations. One had a teardrop-shaped ventral dielectric fairing (similar in shape and size to the standard radome of the PSBN-M radar) installed amidships in lieu of the bomb bay doors. This apparently housed an SRS-2 ELINT set (*izdeliye* 5; SRS = ***stahn****tsiya raz****ved****ki* ***svya****zi* – communications intelligence pack), which entered production in 1951. Such aircraft are known to have served with the Soviet Naval Aviation (specifically, the Black Sea Fleet).

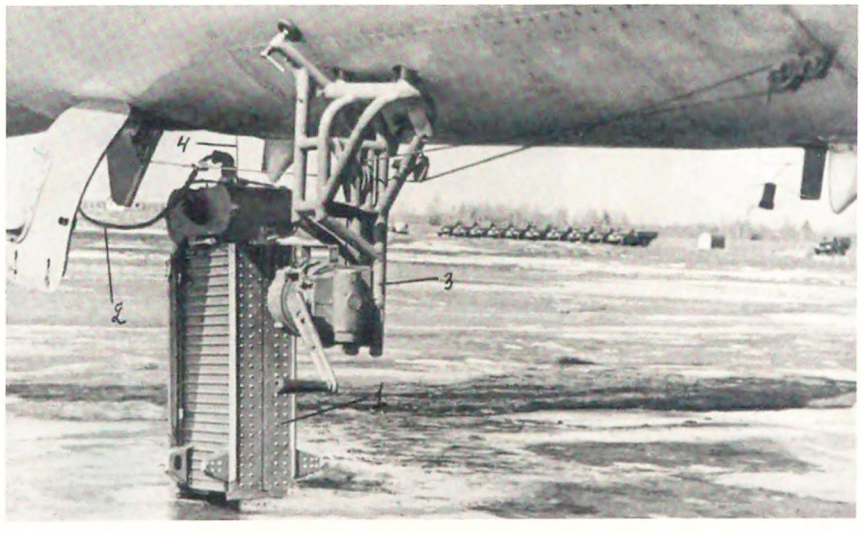
Also, in 1960 or 1961 five Czechoslovak Air Force IL-28s (including Irkutsk-built machines with the c/ns 52114, 52302, 52303 and 52404) were modified locally for ELINT duties and referred to as IL-28RTRs, Russian-style (the Czech-language designation would have been different). The conversion was undertaken by the CzAF's aircraft repair plant at Prague-Kbely AB (LOK – *Letecké opravný Kbely*), most probably in accordance with Soviet manuals, and no two aircraft were identical. Such aircraft were equipped with Soviet-supplied SRS-3 ELINT sets; these could detect and pinpoint the location of up to ten hostile radars working at wavelengths of 2.9-30.16 cm, recording their main operating parameters on photo film. The equipment was housed in cylindrical wingtip pods that were similar in shape and size to the IL-28R's drop tanks but featured dielectric front and rear portions concealing slot antennas and detachable lateral access panels. There were seven such antennas at the front and three at the rear of each pod to give full 360° coverage.

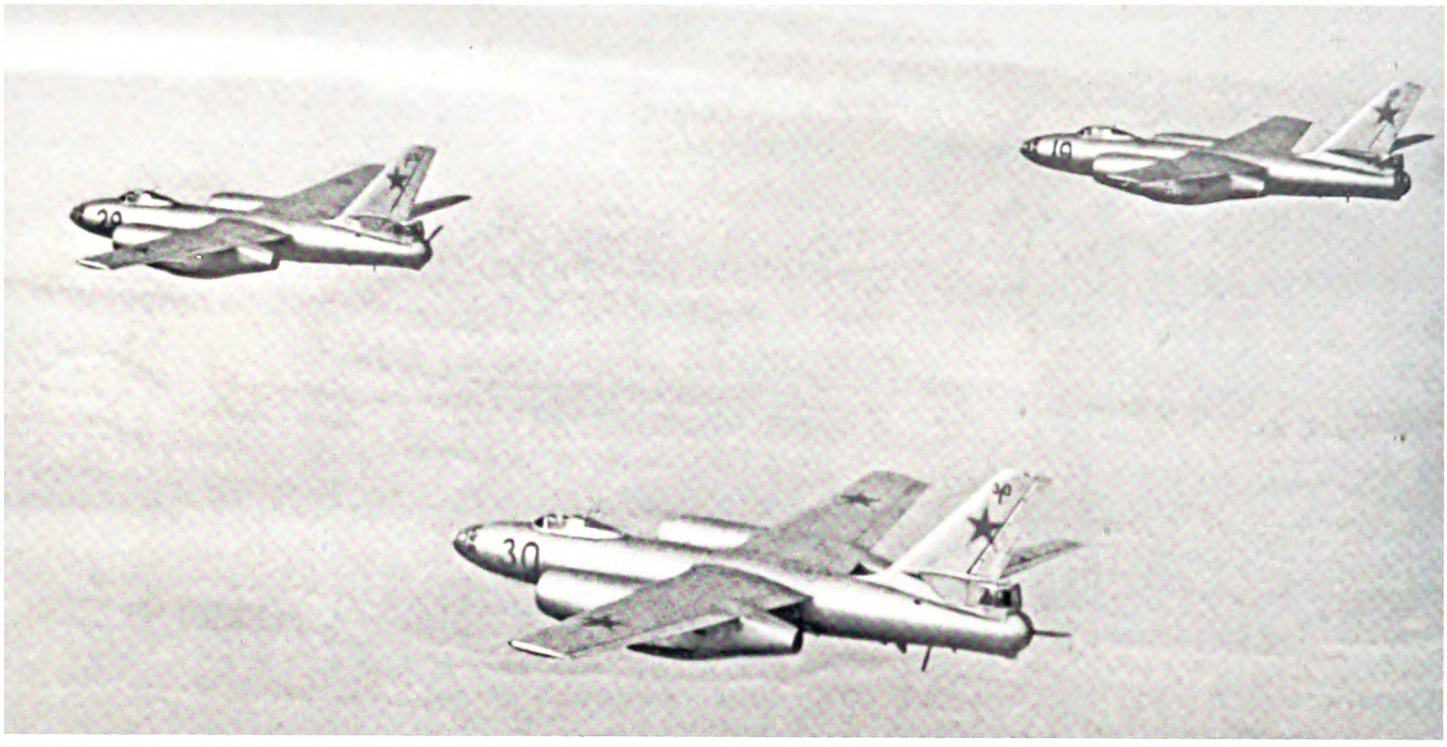
IL-28PP ECM aircraft

Another specialised version was intended for active and passive electronic countermeasures (ECM). Some sources mistakenly call it IL-28REB (***rah****dioelek****tron****naya bor'****ba*** – ECM); however, the official designation found in documents, such as pilot manuals, is IL-28PP (*posta****nov****shchik po****mekh*** – ECM aircraft). It was designed to operate as part of large bomber formations, protecting them against the enemy's ground-based air defence assets.

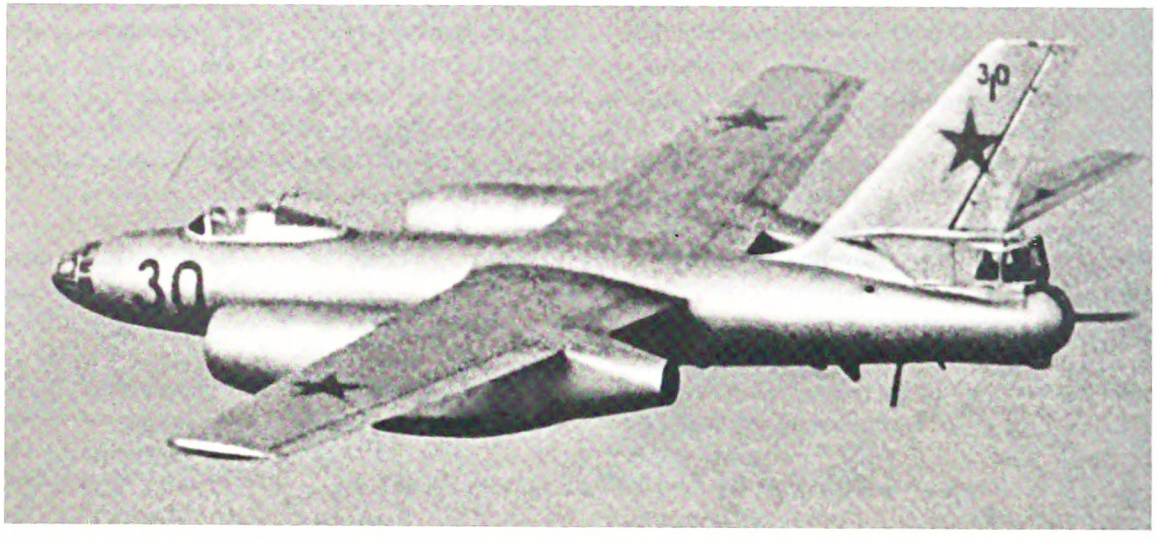
Again, the designation has been applied to two different configurations. One differed little from the standard bomber, featuring two additional outward-canted blade aerials on the rear fuselage underside and a triangular aerial on the centreline further aft. These were associated with an active jammer – apparently the SPS-2 (*izdeliye* 60; SPS = ***stahn****tsiya po****mekh****ovykh sig****nah****lov* – interference emitter). The SPS-2 had an

An ASO-2B Avtomat-2 chaff dispenser ready for loading into the rear avionics bay of an IL-28PP. Note the chaff outlet on the bay cover. The figures on the photo from the test report show the dispenser (1), its control cable (2), the hand-cranked loading hoist (3) and its hoisting cable (4).

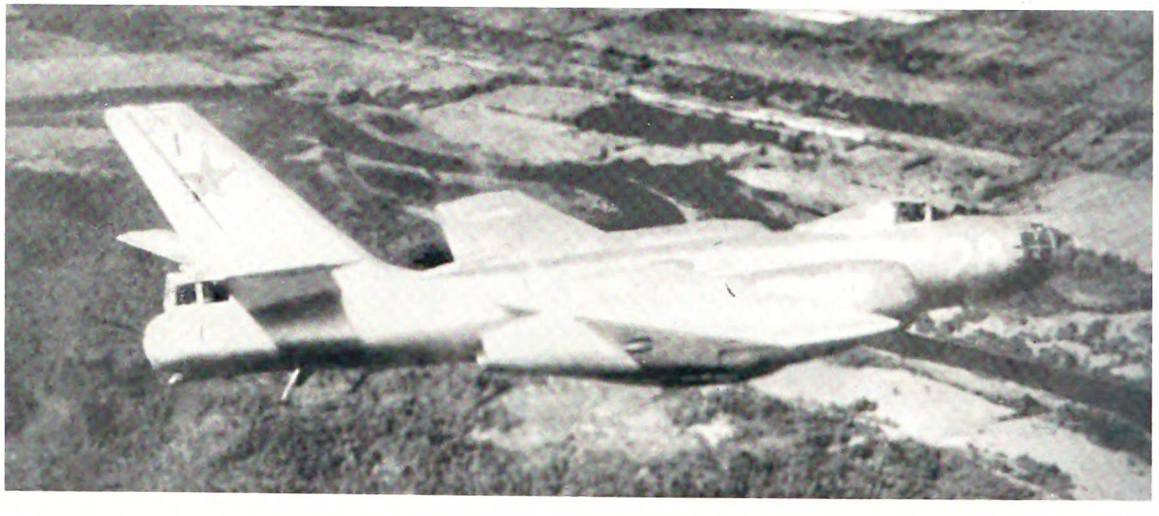




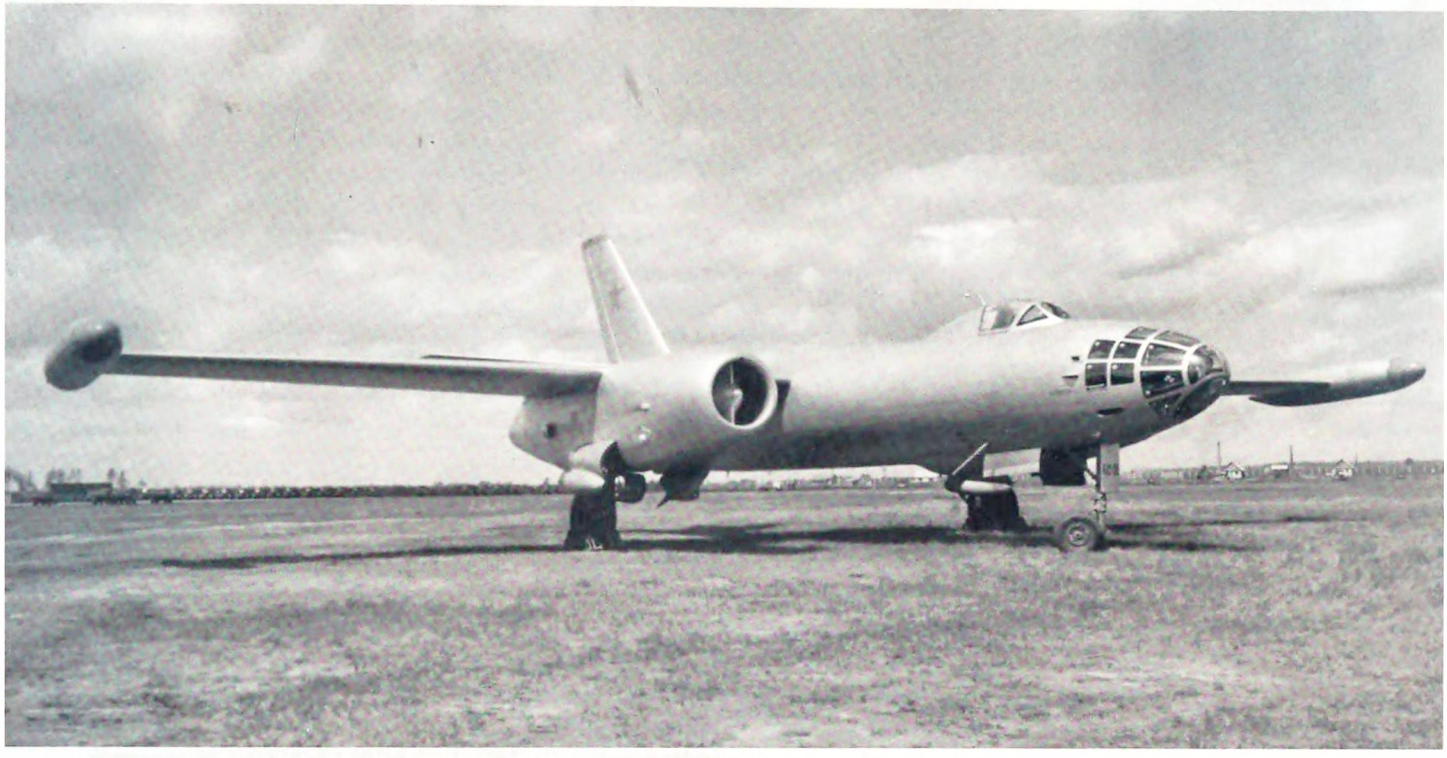
This photo shows an IL-28PP as the port wingman in a flight of bombers.



Close-up of the same aircraft, showing the ECM aerials under the rear fuselage.



'28 Blue', another IL-28PP, features different ECM aerials having an inverted-T shape.



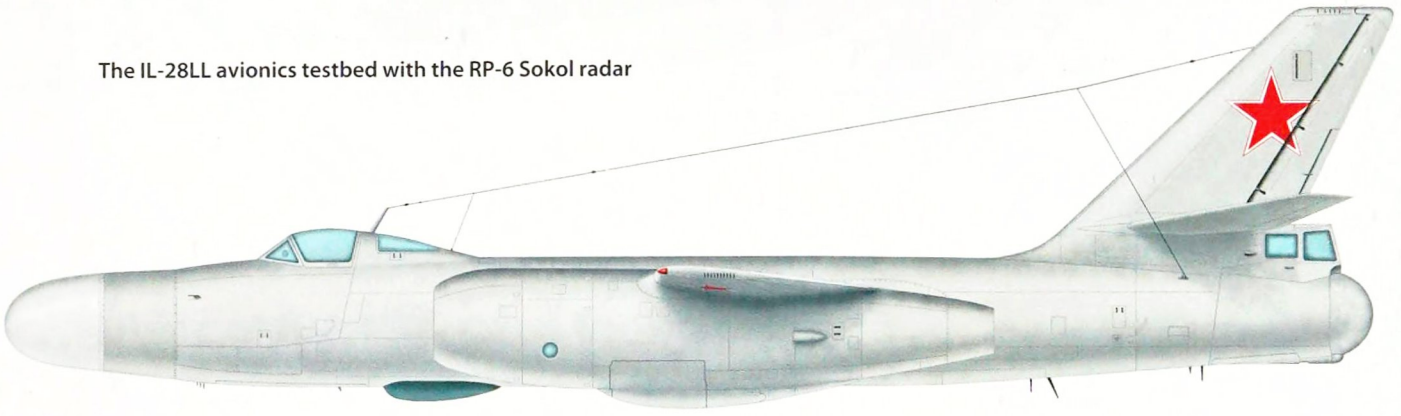
This uncoded aircraft (c/n 54006231) seen during trials represents a different ECM version with wingtip-mounted jammer pods. The dielectric noses of the pods are evident.

operating frequency of 20 MHz and could jam hostile radars working in a 9.5-12.5 cm (3 47/64 in to 4 59/64 in) waveband at a range of up to 150 km (93 miles).

Passive ECM capability was provided by an ASO-2B *Avto**mat**-2* chaff dispenser ('automatic device'; ASO = *appa**raht sbro**sa* [*di**pol'**nykh*] *otra**zha**teley* – 'dipole reflector dispenser'), often referred to erroneously as ASO-28. The device, alternatively designated KDS-16GM (*kas**set**nyy der**zhah**tel' spetsi**ahl'**nyy* – special cassette), was capable of jamming radars working in any of the following wavebands: 3-3.5 cm (1 3/16 in to 1 3/8 in), 9.6-11.1 cm (3 51/64 in to 4 3/8 in), 22.2-24 cm (8 47/64 in to 9 23/64 in), 36 cm (14 11/64 in) and 50 cm (19 11/16 in). It was accommodated vertically in the rear avionics/equipment bay, the chaff outlet being built into the access hatch cover; the loaded dispenser was raised into position by a BL-47 hand-cranked bomb hoist on an external frame clipped to the rear fuselage ahead of the hatch, the cable passing over three rollers on the rear fuselage and the bay roof. The ASO-2B could work in six different modes (incremental or continuous); a single IL-28PP could leave a trail of chaff 800-1,500 m (2,620-4,920 ft) long and 400 m (1,310 ft) deep. The chaff dispenser was tested in 1956; according to some sources, 17 Soviet Air Force *Beagles* were modified to IL-28PP configuration that year.

'126 Red' was one of ten Polish Air Force IL-28s outfitted locally for ECM and ELINT duties and unofficially designated IL-28E. Note the inverted-T aerials under the rear fuselage.

The IL-28LL avionics testbed with the RP-6 Sokol radar



The other configuration had cylindrical wingtip pods similar in shape and size to the IL-28R's drop tanks but, unlike the IL-28RTR described above, only their front portions were dielectric; there were no additional ventral aerials or antenna blisters on the fuselage. The prototype was converted from an unserialled Moscow-built IL-28 *sans suffixe* (c/n 54006231; the nose gear door carried the c/n in abbreviated form as 62-31). Such aircraft saw service with the Soviet Air Force, but there is evidence that the Romanian Air Force had at least one similar aircraft – possibly a local conversion.

IL-28RT ECM aircraft

The Czechoslovak Air Force operated eight or more *Beagles* converted locally into an ECM version designated IL-28RT (*radiotehnický* – 'radio-technical', that is, electronic warfare version). Such aircraft (including c/ns 52216, 55006919 and 55007021) were likewise equipped with SPS-2 jammers and ASO-2B chaff dispensers (called 'ASO-28' in Czech publications). The jammer was housed in the forward fuselage, supplanting the radar set. Again, the conversion was undertaken by LOK, and no two aircraft were identical.

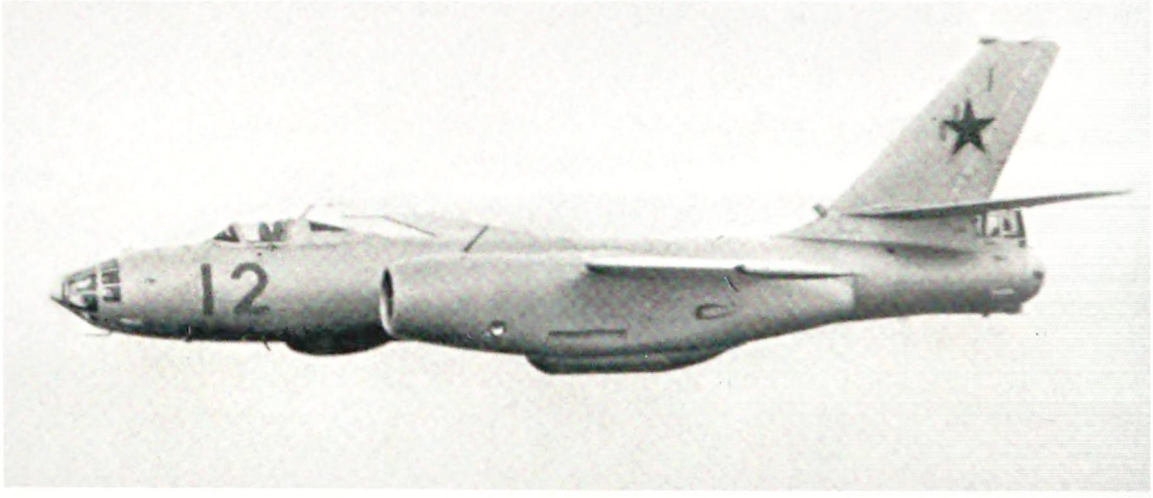
It should be noted that the designations IL-28RT and IL-28RTR are the subject of much confusion – even as far as the Czechs themselves are concerned. Different sources ascribe both designations to the same specific aircraft; for example, IL-28 c/n 52404 is listed as an IL-28RT, even though it has wingtip ELINT pods. Moreover, Czechoslovak Ministry of Defence documents dating back to September 1969 mention 17 (!) IL-28RTs in service with the CzAF but no IL-28RTRs.

IL-28E (IL-28RE) ELINT/ECM aircraft

In the mid-1960s the Polish Air Force bought ten shipsets of SRS-2 and SRS-3 SIGINT equipment, as well as SPS-2 active jammers and ASO-2B chaff dispensers (again referred to as 'ASO-28'). The SRS-2 could detect and pinpoint two to four pulsed-emission radars working at wavelengths of 8.8-200 cm (3 15/32 in to 78 47/64 in).

The equipment was installed the bomb bays of ten Polish IL-28s, adapting them for ELINT and active/passive ECM duties; this necessitated modifications to the bomb bay doors to accommodate a teardrop-shaped dielectric fairing for the SIGINT antennas and a chaff outlet for the ASO-2B. Such aircraft bore the unofficial local designation IL-28E (to be precise, Ił-28E) or IL-28RE (Ił-28RE), the suffix denoting *elektronicznyy* or *radioelektronicznyy* – electronic.

'12 Red', an obscure IL-28 avionics testbed with a ventral pod having a dielectric front end, an extra blade aerial aft of the cockpit and a cine camera on the fin leading edge.



IL-28 radiation reconnaissance aircraft

The assorted aircraft operated by the Soviet Air Force's 647th SAPSO (*smesh*annyy *avia*polk *spetsial'novo obespech*eniya – Composite Special Support Air Regiment), which was part of an establishment called the 71st Test Range and based at Bagerovo AB on the Crimea Peninsula, included two IL-28s fitted with air sampling pods developed by TsAGI for radiation reconnaissance. Compressed air bottles were installed in the bomb bays to pressurise the cockpits, preventing ingress of radioactive dust. As an additional protective measure the cockpit walls were lined with lead sheets, and radiometers were provided for the crew.

These aircraft were periodically deployed to Semipalatinsk, Kazakhstan, operating in support of the Soviet nuclear weapons test programme during the 1950s. Together with other similarly modified aircraft and helicopters of various types these *Beagles* flew through radioactive clouds in the wake of nuclear tests at the Semipalatinsk Proving Ground, measuring radiation levels. For example, in 1954 such flights were made by 71st Test Range crews captained by pilots I. A. Berdnikov, A. A. Bryksin and V. M. Shafiyev.

IL-28 – Finnish air sampling version

A rather different version serving much the same purpose was developed by the Finnish Air Force. The main reason for this was the Soviet nuclear tests at the northern proving ground on Novaya Zemlya ('New Land') Archipelago; radioactive products of the nuclear blasts were carried far and wide by the winds and could reach Finland, causing much concern.

Hence the Finnish IL-28Rs could be equipped with indigenously developed air sampling pods looking like long, thin bottles with a short neck. Four such pods in two different versions were mounted in vertical pairs on special frames under the wing roots – in much the same way as the standard JATO boosters, except that the pods were horizontal (or rather parallel to the fuselage waterline). Two pods of each version were carried. Apart from radiation monitoring, the pods were used for air pollution monitoring, giving rise to the nickname 'pollution cans'.

Test and development aircraft

More or less extensively modified *Beagles* and *Mascots* were used for all manner of test and development work, both in the Soviet Union and abroad. Rather confusingly, many of the Soviet testbeds were referred to by the same designation, IL-28LL (*leta*yushchaya *laborator*iya – lit. 'flying laboratory'). This Russian term is used indiscriminately and can denote any kind of testbed (avionics, engine, equipment, weapons and so on), an aerodynamics research aircraft or control configured vehicle (CCV), a weather research aircraft, a geophysical survey aircraft and the like.

1. Avionics testbeds

IL-28LL radar testbed

A single *Beagle* bomber was converted in 1952 as the IL-28LL for testing the RP-6 *Sokol* (Falcon) radar; RP stood for *rah*dioprit*sel* ('radio sight'), the Soviet term for fire control radars. This radar with a 30-km (18.6-mile) detection range had been developed by NII-17 under the direction of Ghedaliy M. Koonyavskiy for two interceptors – the Yakovlev Yak-120, which entered production and service as the Yak-25 *Flashlight-A*, and the Lavochkin La-200B, which remained in prototype form. Initial tests of the RP-6 were performed on a converted Boeing B-17G Flying Fortress – one of those which had been repaired and pressed into Soviet Air Force service in 1945 after crash-landing in Eastern Europe due to battle damage received in shuttle raids on Germany. When it transpired that development of the Yak-120 was taking longer than predicted and the La-200 would be the first to receive the new radar, OKB-301 General Designer Semyon A. Lavochkin suggested that an aircraft faster than the B-17 be used to bring the radar up to scratch. The IL-28 was the obvious choice.

To accommodate the radar the glazing of the navigator's station was cut away at fuselage frame 2 and substituted by a cylindrical metal 'plug' (part of the Yak-120's nose incorporating the avionics bay); this required some local reinforcement because the radar weighed close to 500 kg (1,100 lb). The RP-6's huge antenna dish of more than 1 m (3 ft 3⅜ in) diameter was enclosed by a large glassfibre radome which had an almost hemispherical front end rather than the usual pointed or ogival shape. The conversion job was done by Lavochkin OKB specialists under the supervision of the Ilyushin OKB (which was not directly involved in the project but held responsibility for the IL-28 anyway).

The famous test pilot Mark L. Gallai flew the IL-28LL, with R. A. Razumov as test engineer. The latter had to work in extremely uncomfortable conditions, sitting in a dark and cramped bay aft of the radar set – an abbreviated version of the navigator's station. A total of 33 flights were made without any problems; the test programme, which ended in December 1952, included simulated interception of real aircraft. Later, tests of the Sokol radar continued on the La-200B which, after being rejected by the VVS, found use as a testbed. By the end of 1953 the radar had been verified and was fitted to the late-production Yak-25M from 1954 onwards, replacing the RP-1D *Izum***rood** (Emerald) radar fitted to the Yak-25 *sans suffixe* as a stop-gap measure.

IL-28 missile guidance system testbed

In 1960 the Ministry of Defence's Central Research Institute No.30 (TsNII-30 – *Tsen***trahl'***nyy na***ooch***no-is***sled***ovatel'skiy insti***toot**) teamed up with NII-2 and

'01 Blue', a testbed of unknown purpose with wingtip pods and vertical strakes under the wing roots.

IL-28U '18 Blue' was an avionics testbed with an unusual L-shaped aerial under the nose.

the Research Institute of the State Committee for Electronics (NII GKRE – *Na**ooch**no-is**sled**ovatel'skiy insti**toot** Gosu**dar**stvennovo komi**teta** po **rah**dioelek-**tron**ike*) to develop active radar homing systems for anti-shipping missiles. To this end it was necessary to analyse the parameters of the radar pulses reflected from surface ships. Hence an IL-28 and a Li-2T transport were converted into avionics testbeds equipped with two experimental radars and special recording equipment.

The measurement and recording system (MRS) developed by NII-2 was housed in the *Beagle*'s bomb bay. It included a high-speed cine camera filming the radar pulses reflected from the ship, which appeared as lines on the radar display. The two testbeds made more than 50 flights from Kirovskoye AB on the Crimea Peninsula, using Black Sea Fleet cruisers, destroyers and minesweepers as 'targets'. The ships were either anchored on the roadstead at Feodosiya or moved on predetermined headings. Measurements were made in

38 flights at 2,000-5,000 m (6,650-16,400 ft) and 110-167 m/sec (360-550 ft/sec) at 10-50 km (5.4-27 nm) range.

43 measurements were made with the cruisers, 64 with destroyers and 40 with minesweepers at various sighting angles in various sea state conditions. The results were analysed by a computer, which made it possible to develop algorithms for determining the class of a ship in a group; this helped to develop guidance systems for stand-off anti-shipping missiles.

Photos exist of an IL-28 coded '12' – same as on the IL-28LSh but painted on in a different style – that was clearly converted into an avionics testbed of some sort. It featured a large fairing or pod with a dielectric front end in place of the bomb bay doors, a forward-pointing probe aerial under the extreme nose, an additional swept blade aerial on the port side of the lower forward fuselage and a faired cine camera at the top of the fin. All armament was removed. It seems likely that this was the aircraft in question.

IL-28 avionics (?) testbed

Another IL-28 coded '01 Blue' and carrying the additional numeral '6' on the fin was converted into a particularly obscure testbed. The aircraft was equipped with wingtip pods which were smaller than the regular tip tanks, featuring a curious D-shaped cross-section (the outer sides were convex and the inner sides flat) and conical ends. Two flat strake-like objects were mounted vertically under the wings just inboard of the engine nacelles. The air intake leading edges and fin tip were painted blue, suggesting the aircraft belonged to LII (this was common practice at the institute in the 1950s/1960s).

IL-28U automatic landing system testbed

An IL-28U trainer coded '18 Blue' was converted into a testbed for an automatic landing system, sporting several non-standard aerials – an L-shaped strut under the extreme nose, outward-canted rod aerials under the forward fuselage (flanking the nosewheel well) and a triangular aerial under the rear fuselage. The tests took place in 1957.

IL-28 control system testbed

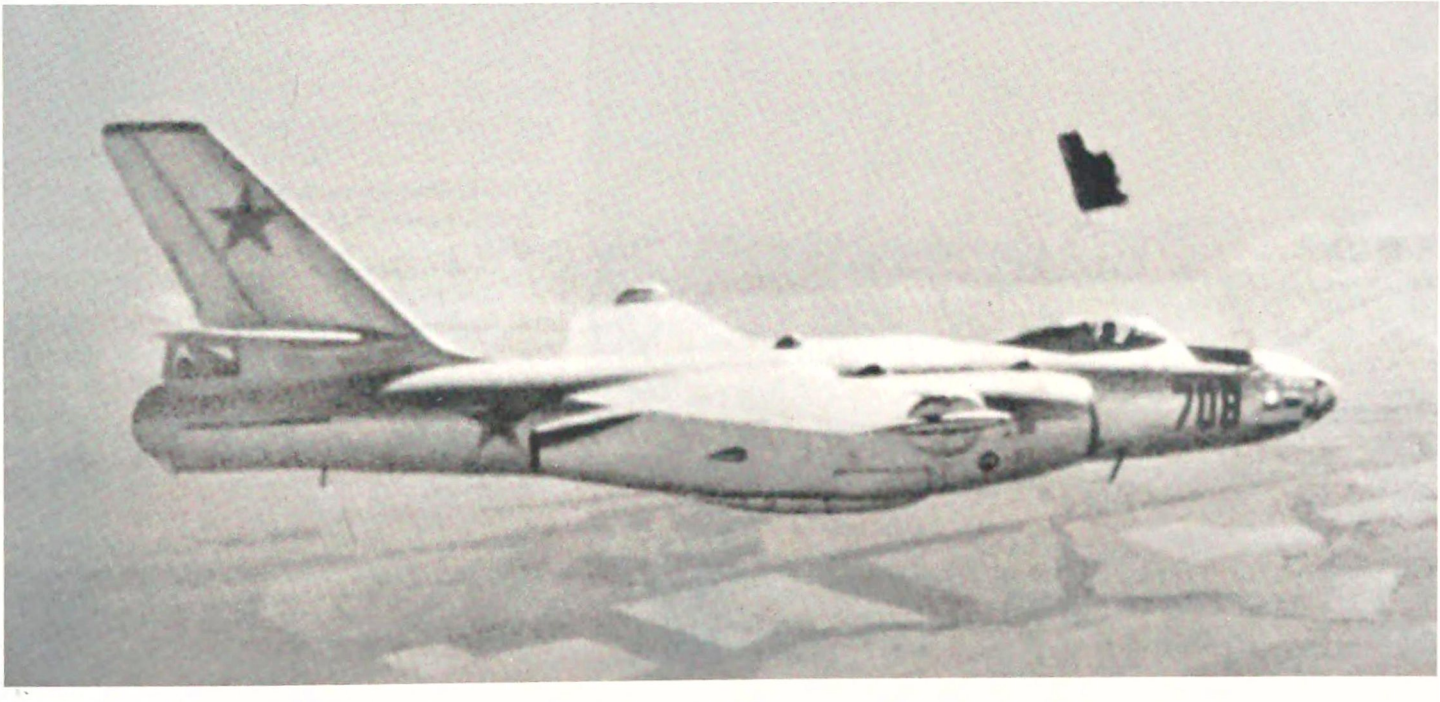
In 1953-54 an unidentified IL-28 was used to verify the automatic take-off and landing system developed for the IL-28M target drone.

2. Ejection seat testbeds

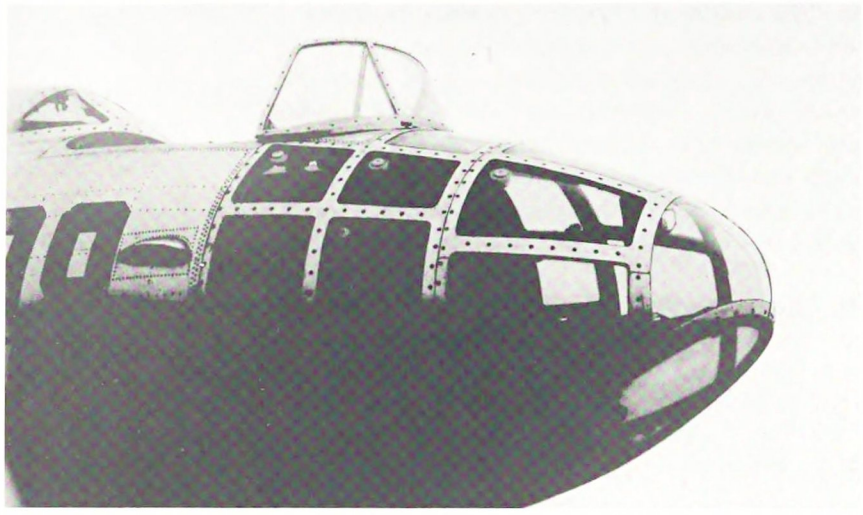
IL-28LL ejection seat testbeds

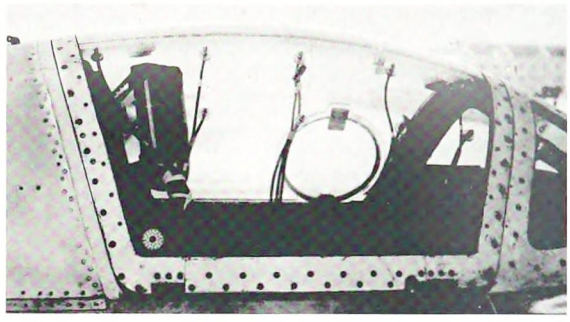
The IL-28 was extensively used for testing crew rescue systems. Over the years LII operated at least three IL-28s as ejection seat testbeds, and two of them were *Beagles*. The first of these, serialled '708 Blue' under the pre-1955 system (c/n ...708), served for verifying the IL-28's own crew escape system, if nothing else. To this end the navigator's hatch cover was removed and a small Perspex visor was fitted ahead of the hatch, protecting the tester against the slipstream up to the moment of ejection. Six cine cameras were installed in small fairings above the wing roots and above/below the wingtips (the lower ones pointed aft at the gunner's station). Photo calibration markings looking like hatched lines were applied to the rear fuselage, and the air intake leading edges were painted blue.

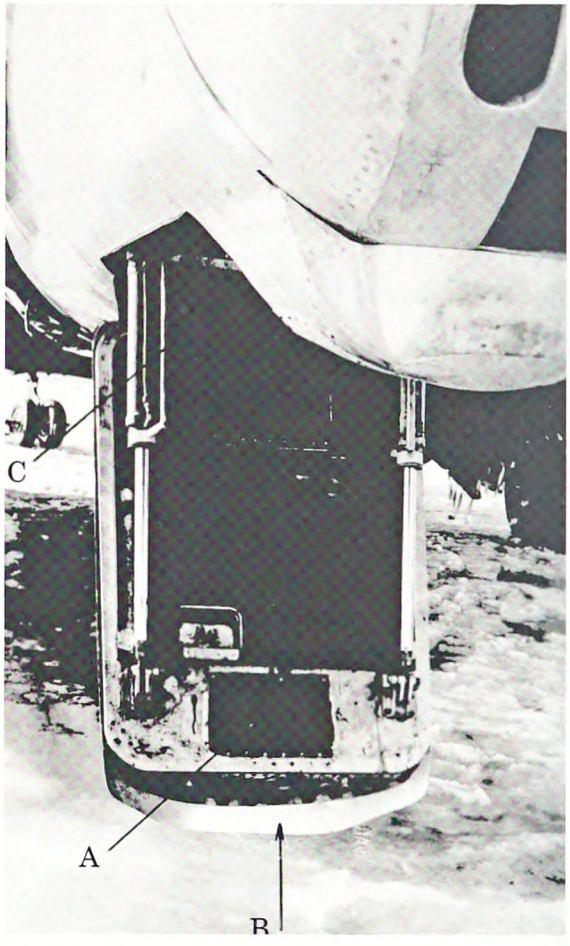
The tests of '708 Blue' proceeded in 1950-51 in keeping with MAP order No.664 dated 25th August



A seat with a tester is ejected from the navigator's station of IL-28LL '708 Blue' in late 1950 or early 1951. Note the cine camera fairings on the wings and the photo calibration markings on the rear fuselage.







Above left: The nose of IL-28LL '708 Blue' with a protective visor ahead of the open navigator's hatch.

Left: LII test pilot Yuriy A. Garnayev in an experimental pressure suit with a full-face helmet poses with '708 Blue' before a flight. Note the oxygen supply hose attached to a high-pressure bottle until the suit is connected to the on-board oxygen system.

Top: The cockpit canopy of the same aircraft with venting holes drilled in the transparency for an experiment.

Above: The gunner's entry hatch of '708 Blue' with modifications to improve entry and egress (including bailing out). The letters indicate an additional step on the hatch cover (A), an extension of the cover skin to improve aerodynamics (B) and the sealed gap between the cover and the fuselage (C).

1950. The aircraft was flown by LII test pilot Aleksandr A. Yefimov and test parachutist Fyodor M. Morozov. The engineers in charge were Yuriy V. Komm (Ilyushin OKB), Yevgeniy F. Schwarzburg and V. N. Molochayev (LII).

As part of the test programme Morozov bailed out from the gunner's station at an altitude of 2,000 m (6,560 ft) and indicated airspeeds of 450 km/h (279 mph), 460 km/h (285 mph), 570 km/h (354 mph), 600 km/h (372 mph) and 630 km/h (391 mph). LII test pilot Yuriy A. Garnayev is known to have parachuted (or ejected?) from this aircraft in an experimental high-altitude suit.

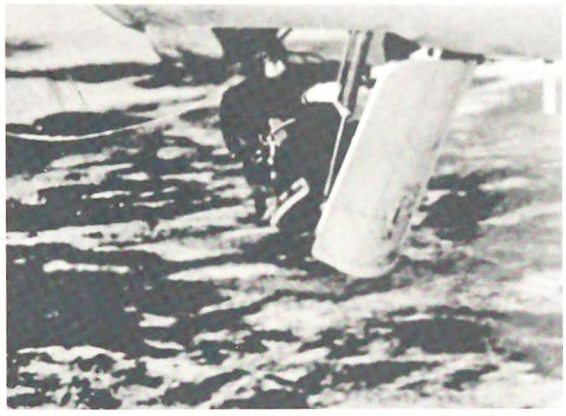
Under one of the test programmes a lot of vent holes were drilled in the pilot's canopy transparency of '708 Blue'.

The other *Beagle* (c/n 53005710) was modified much more extensively and used for a lot longer, serving with LII from 1953 all the way to 1978. In its early guise, when it was serialled '710 Blue' under the pre-1955 system, the gunner's station was cut away from behind, leaving only the foremost pair of side windows, and a large slab-sided fairing was grafted on, increasing overall length appreciably. This fairing, which incorporated another pair of side windows, featured tracks that allowed the experimental ejection seat to be fired both upwards and downwards. LII's previous ejection seat testbeds – the UTI MiG-9LL *Fargo*, the UTI MiG-15LL and the Tu-2LL – did not permit downward ejection. The upper and lower apertures were closed by covers when not in use; a circular hatch was provided at the lower end of the tail fairing for access to the ejection gun.

Not so obvious was the fact that a second 'ejection station' was located amidships (in the bomb bay); this likewise permitted ejection both upwards and downwards, the tester facing forward or aft in both cases. The No.3 fuel tank was removed, a bulkhead was installed at fuselage frame 21 and the bomb bay doors were cut in line with this frame; their forward portions could be opened in flight to enable ejection or removed altogether, creating a hatch measuring 1.49 x 0.75 m (4 ft $10^{21}/_{32}$ in x 2 ft $5^{17}/_{32}$ in). The upper aperture was apparently closed by a cover when not in use. The rear section of the bomb bay housed test equipment. The radar and the cannons were removed.

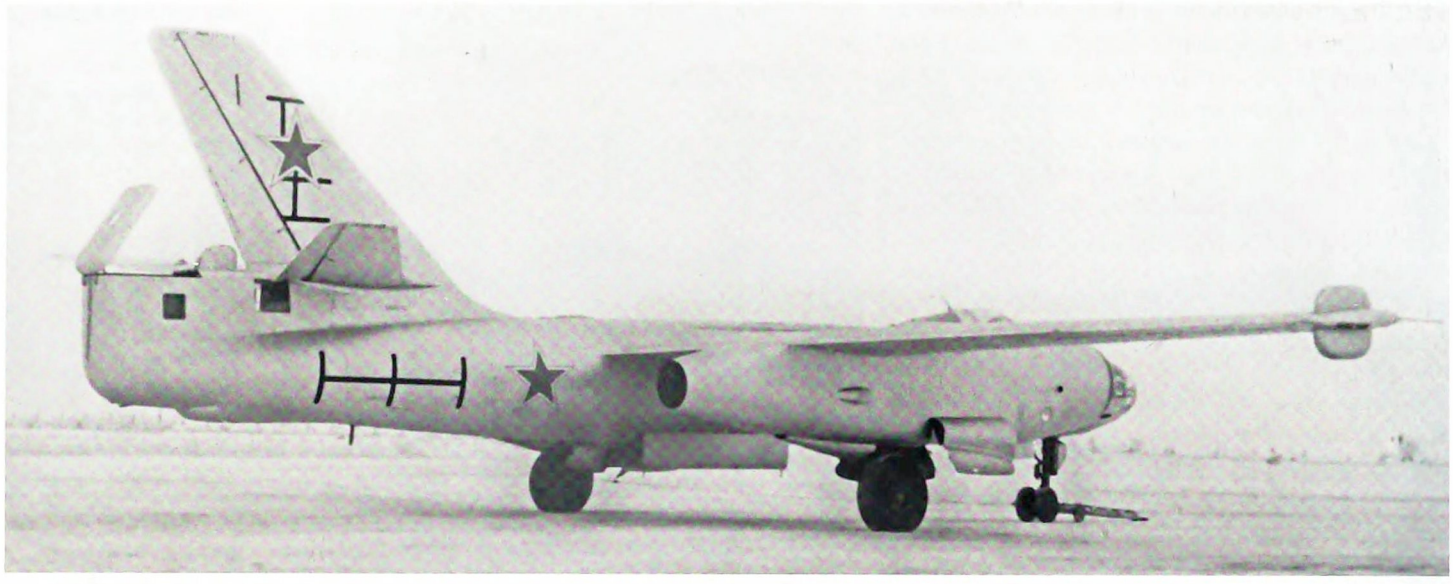
High-speed cine cameras were mounted in teardrop fairings above and below the wingtips, as well as on the nose gear's forward door (looking aft) and ahead of the rear ejection station (immediately aft of the rudder), to capture the ejection sequence. T-shaped and H-shaped photo calibration markings were applied to the fin, the forward and rear fuselage.

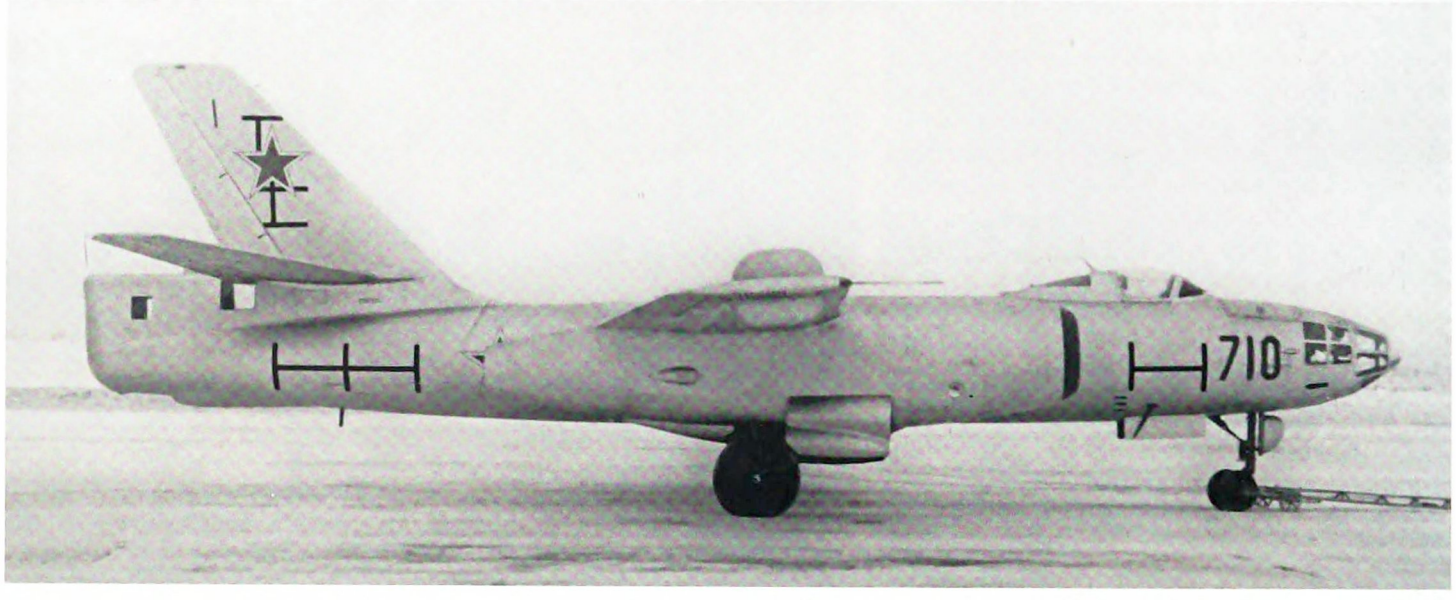
The conversion was performed by LII's Complex 5 in 1954, whereupon the aircraft was test flown by Yuriy A. Garnayev; V. I. Khlimanov was engineer in charge of the tests, with S. I. Shatov as his assistant. The aircraft



Left: Test parachutist Fyodor M. Morozov hangs on to the handles on the gunner's hatch actuation rams on IL-28LL '708 Blue' before the jump.

Below: This sequence shows the gunner's hatch cover of '708 Blue' being jettisoned before the tester bails out.





Top and above: IL-28LL '710 Blue in early guise, showing the modified gunner's station, the modified bomb bay doors, the many camera fairings and the photo calibration markings.

Left: Close-up of the rear 'ejection station'.

Below: The 'ejection station' control panel in on the starboard cockpit console of '710 Blue'.

A Tu-K-21 ejection seat is fired from the forward 'ejection station' of IL-28LL '10 Blue' at ground level.

permitted safe ejection at speeds up to 780 km/h (484 mph) IAS.

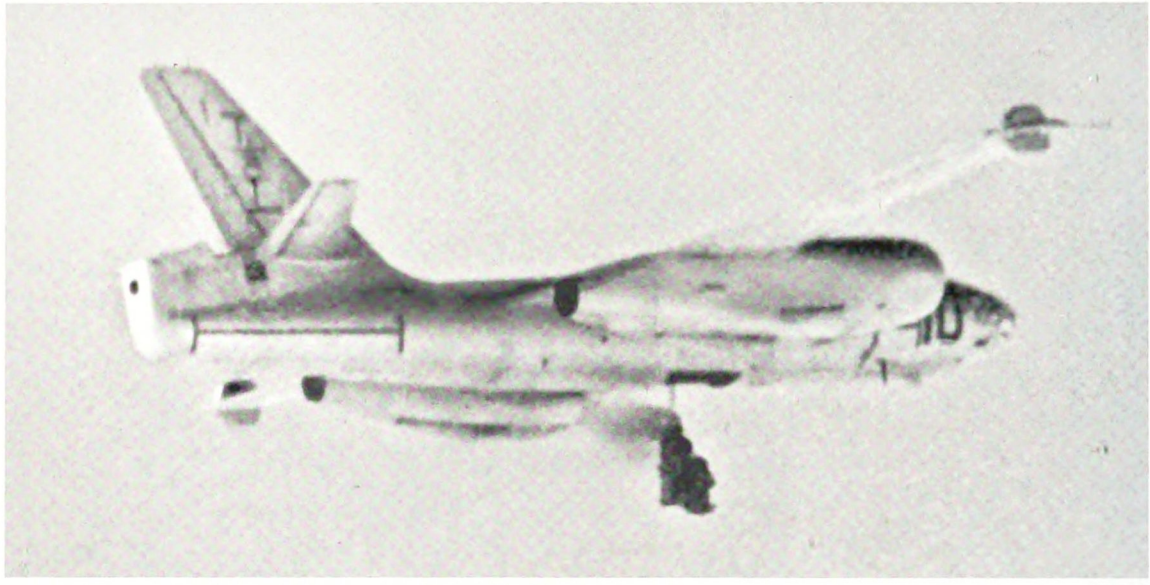
After 1955 the serial was abbreviated to '10 Blue' and the aircraft was further modified. In early 1958 it was used for testing an ejection seat intended for the NM-1 demonstrator aircraft (*na**toor**naya mo**del'*** – 'working model') developed by OKB-256 under Chief Designer Pavel V. Tsybin. First flown on 7th April 1959, this was a subscale version of the Tsybin RSR Mach 2.65 strategic spyplane (*re'ak**tiv**nyy samo**lyot**-raz**ved**chik* – jet-powered reconnaissance aircraft, as simple as that). The seat was a version of the IL-28's stock seat modified to eject downwards and fitted with a TSM-1050 telescopic ejection gun (*telesko**pich**eskiy stre**lya**yushchiy mekha-**nizm***). Two successful ejections with dummies were made at 800 m (2,620 ft) at indicated airspeeds of 500 km/h (310 mph) and 600 km/h (372 mph). However, the full-size RSR was in fact never built.

In 1960 the Soviet Union was preparing to put a man into space for the first time; as part of this effort, OKB-918 led by Semyon M. Alekseyev created a special ejection seat for the *Vos**tok*** (East) spacecraft – the world's first manned spacecraft under development by Sergey P. Korolyov's team. The bulky Vostok ejection seat could not be accommodated fully within the IL-28LL's forward ejection station and protruded above the upper fuselage; hence a large teardrop fairing with flattened sides was installed aft of the cockpit to protect the tester from the slipstream.

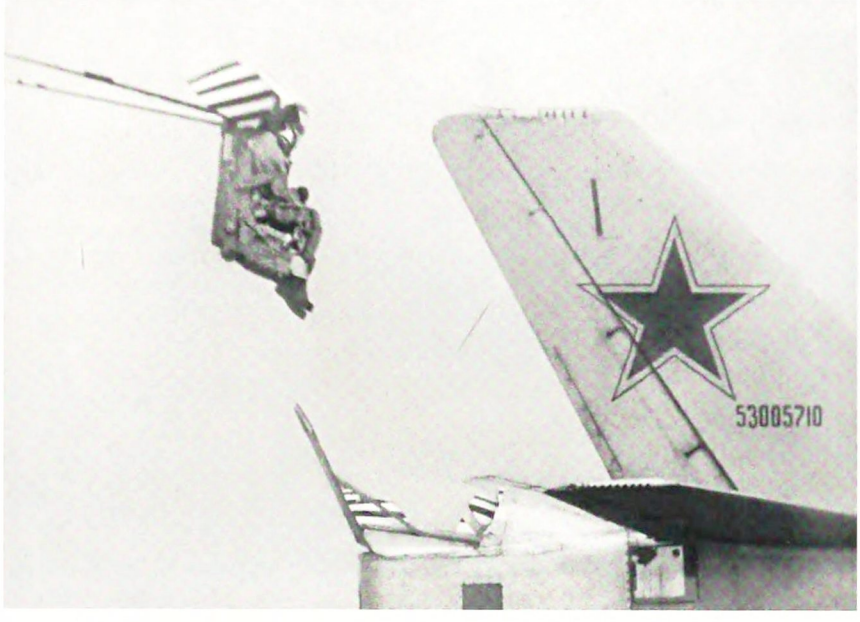
The Vostok ejection seat was tested successfully; one of the ejections was performed on 30th March 1960 by test parachutist V. I. Golovin who ejected at 640 km/h

Another ejection of the Tu-K-21 seat in 1963 during a high-speed run at 200 km/h with the nosewheels off the ground.

The same scene a second later; the seat's powder cartridge has burnt out and the stabilising parachute is starting to deploy.



The seat designed for the Myasishchev M-50A is fired from the forward 'ejection station' with the front segments of the bomb bay doors removed. The photo calibration markings are different here.

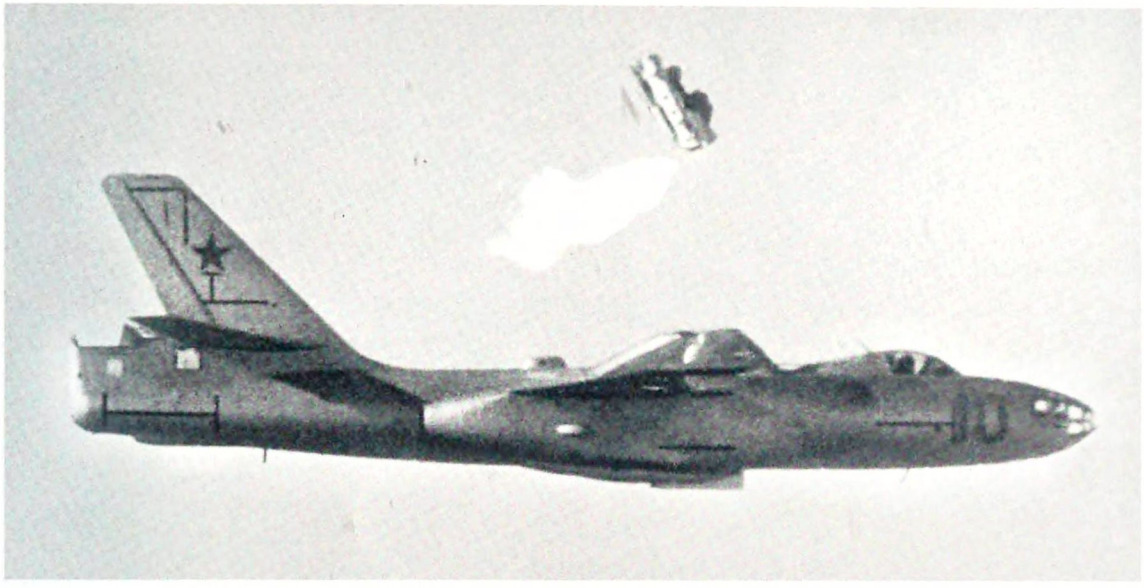


What looks like a prototype Zvezda K-36 'zero-zero' seat is fired through the striped canopy of the rear ejection station. Note the distinctive telescopic stabilising booms tipped with drogue parachutes extended from the headrest.

(397 mph) IAS and 3,600 m (11,810 ft). On at least one occasion the Mikoyan/Gurevich SM-50 fighter (aka MiG-19SU, an experimental version of the MiG-19SF *Farmer-C* with a ventral U-19 liquid-propellant rocket booster) flew as chase plane.

Later the 'superstructure' of the forward ejection station was removed. In this guise '10 Blue' was used, among other things, for testing the Tupolev Tu-K-21 ejection seat created for the Tu-128 *Fiddler* two-seat heavy interceptor. This seat was fired from the forward station during high-speed runs at 150 km/h (93 mph) IAS on 11th April 1963 and at 200 km/h (124 mph) IAS at an unspecified date; on both occasions the occupant was a dummy. Upward ejections of the same seat (or a similar model) from the forward station were made in flight at 6,000 m and indicated airspeeds of 340 km/h (211 mph) and 716 km/h (444 mph). A downward-firing seat developed for the Myasishchev M-50A *Bounder* supersonic strategic bomber was fired from the forward

Another ejection from the rear station, with the seat's parachute system already beginning to deploy.



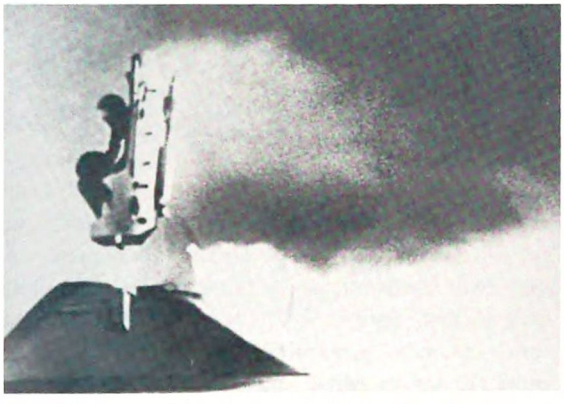
IL-28LL '10 Blue' fires the ejection seat developed for the Vostok spacecraft; the seat necessitated installation of a special dorsal fairing. Note the open ventral blast doors, the open top of the rear ejection station (with a small metal visor ahead of it) and the revised photo calibration markings.

station at 500 km/h (310 mph), 600 km/h (372 mph) and 716 km/h IAS. Upward ejections from the rear station were made at 700 km/h IAS.

IL-28U-LL ejection seat testbed

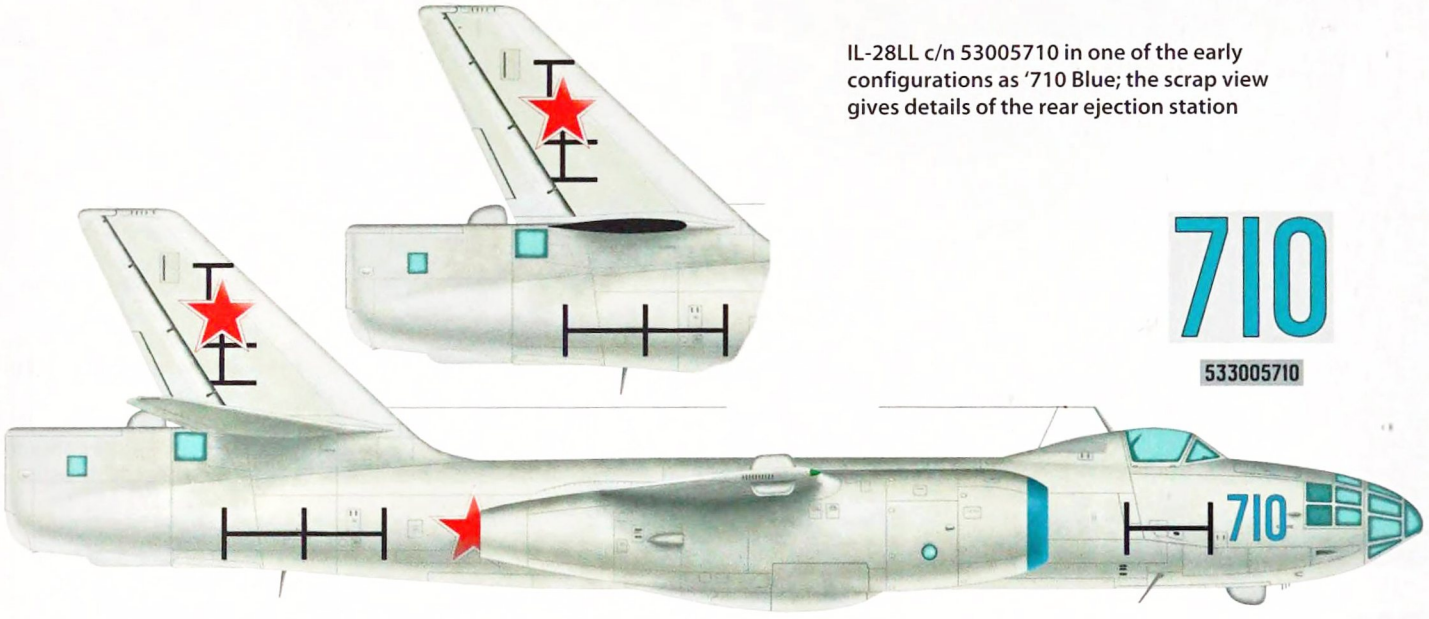
The third ejection seat testbed operated by LII was a *Mascot* serialled '501 Blue' (c/n 5030...501 or 63051...501), which was known as the IL-28U-LL. It was tested concurrently with IL-28LL '708 Blue' under the same programme and pursuant to the same MAP order No.664. The reason is obvious – the pilot's ejection seat had to be tested, and only the IL-28U had dual controls so that someone would be able to land the aircraft after the occupant of the main cockpit had ejected.

The IL-28U-LL had cine cameras on top of the wingtips only. Again, the air intake leading edges were painted blue and photo calibration markings in the form of hatched lines were carried on the rear fuselage.

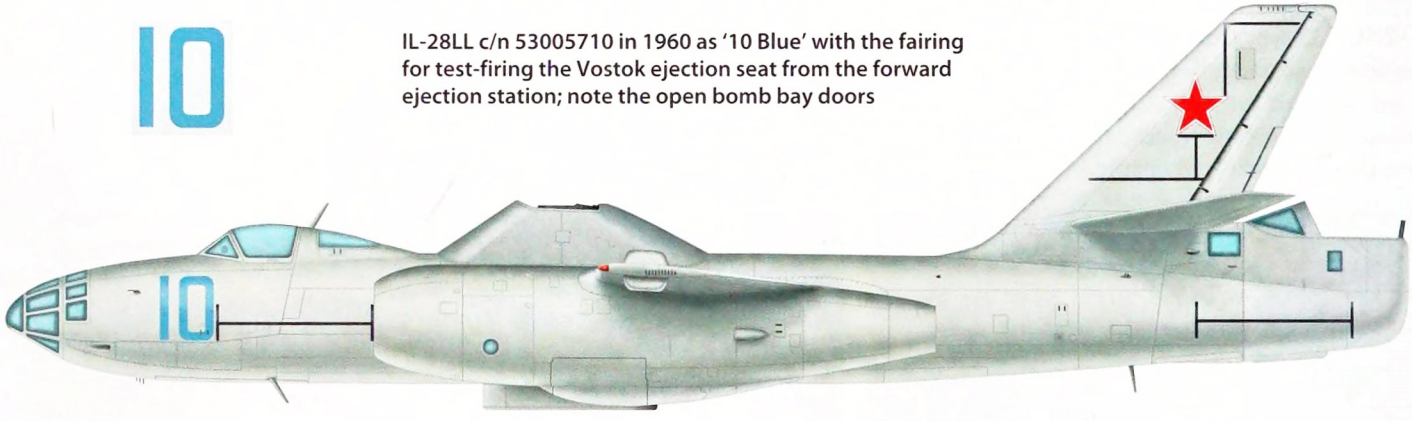


Left, far left and below: Stills from footage filmed by the upper port wing camera of IL-28LL '10 Blue'; the Vostok ejection seat spouts terrific flames as it leaves the dorsal fairing. Note the full-face pressure helmet of the tester and the SM-50 chase plane in the lower photo.

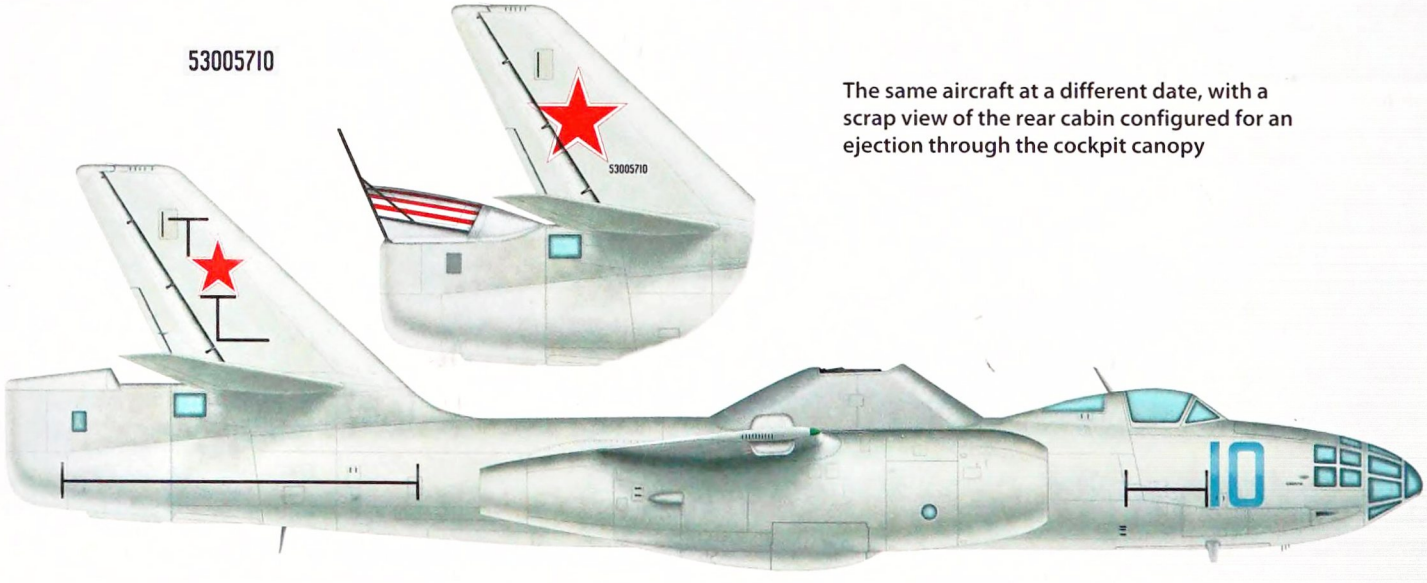
Far left: Another downward ejection from the forward station. The camera on the nose gear door is used for filming it, as are the cameras under the wingtips.



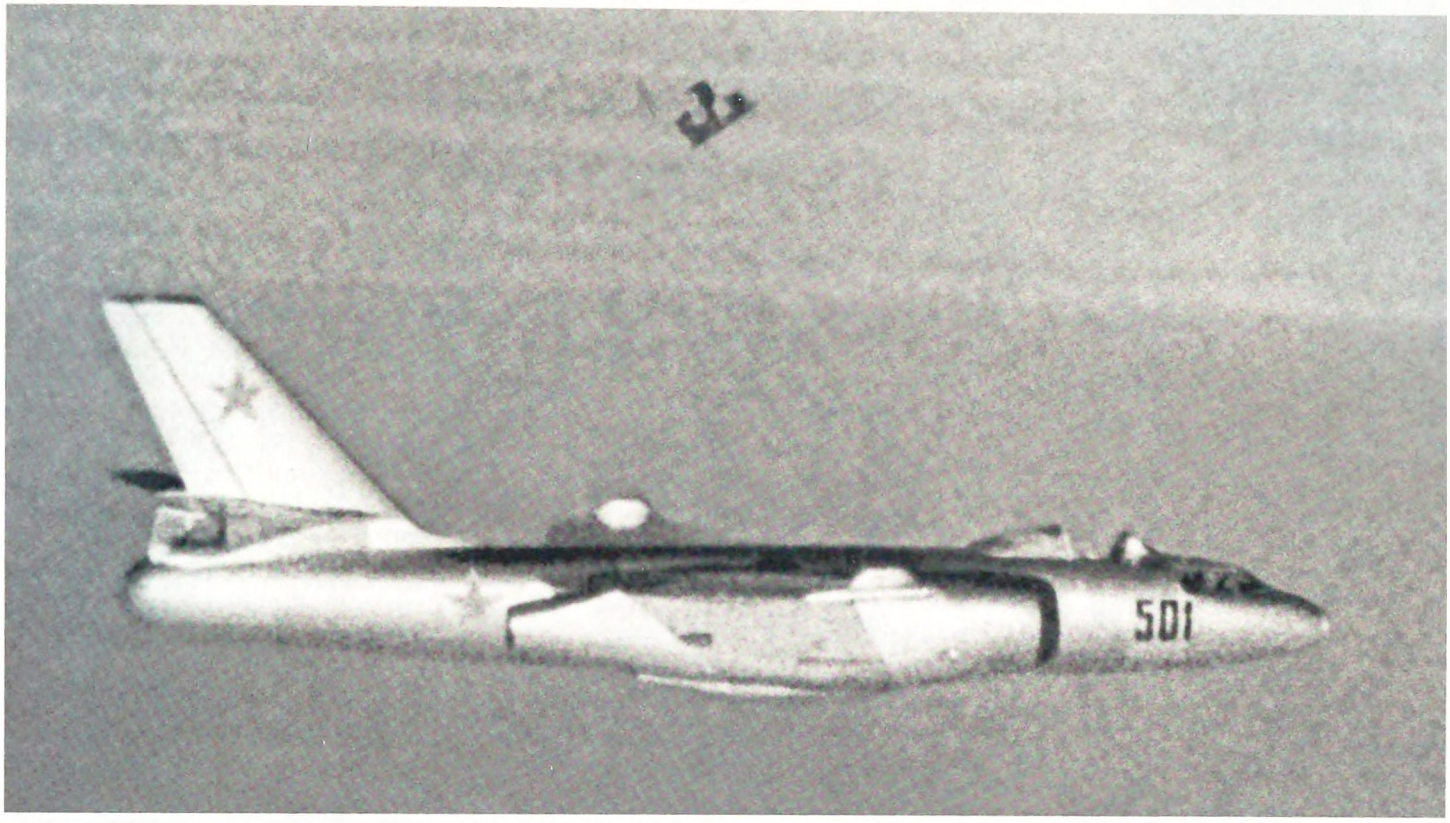
IL-28LL c/n 53005710 in one of the early configurations as '710 Blue; the scrap view gives details of the rear ejection station



IL-28LL c/n 53005710 in 1960 as '10 Blue' with the fairing for test-firing the Vostok ejection seat from the forward ejection station; note the open bomb bay doors



The same aircraft at a different date, with a scrap view of the rear cabin configured for an ejection through the cockpit canopy



A test ejection from the trainee's cockpit of IL-28U-LL '501 Blue'.

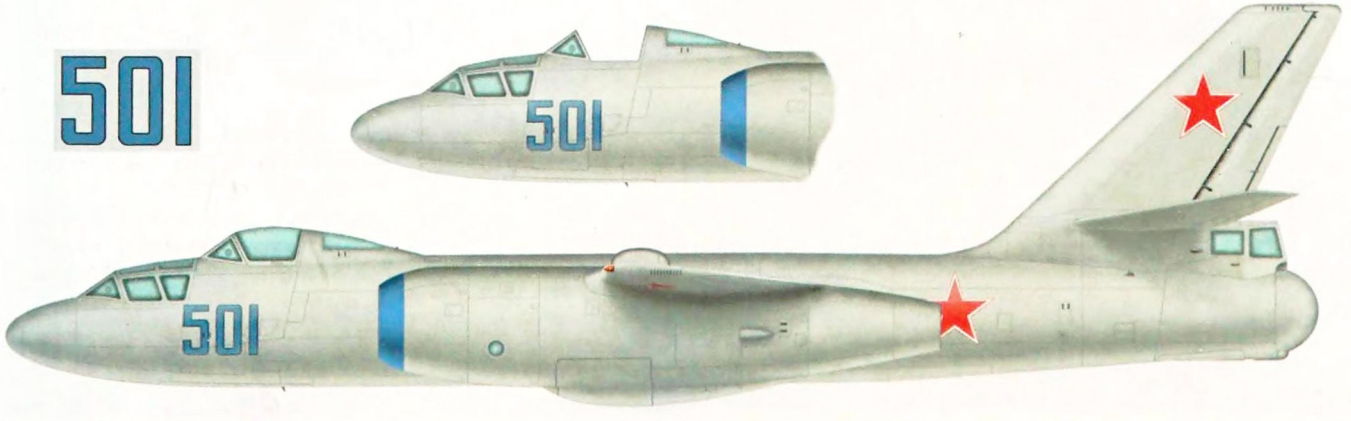
Ejections were made alternately from both cockpits at an altitude of 2,000 m (6,560 ft) and various speeds, including 400 km/h (248 mph), 500 km/h (310 mph) and 600 km/h (372 mph). They showed that safe ejection of the pilot and the navigator was possible at speeds up to 700 km/h (435 mph) IAS, the seats clearing the vertical tail safely. However, ejection at speeds above 650 km/h (403 mph) was difficult because turbulent air entered the cockpit when the canopy was jettisoned, making it impossible for the pilot to press his head firmly to the seat headrest as required by the flight manual. Bailing out from the gunner's station was possible at speeds up to 630 km/h (391 mph) IAS; at higher speeds it was fraught with injuries. The test report recommended that improved ejection seats with a face protection blind and leg restraints be developed for the IL-28.

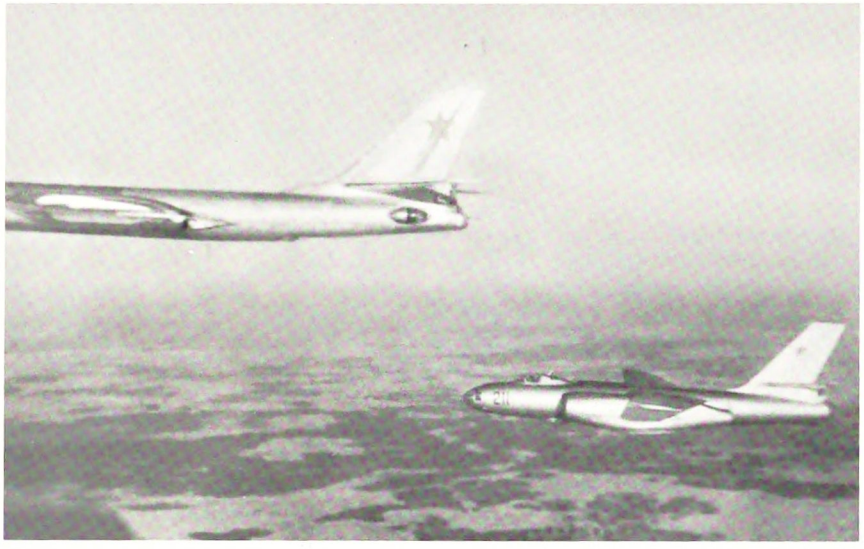
3. In-flight refuelling system testbeds

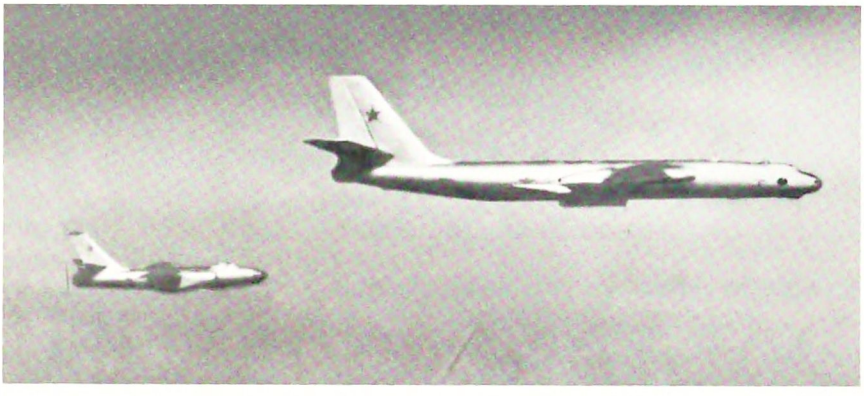
IL-28LL 'tankers'

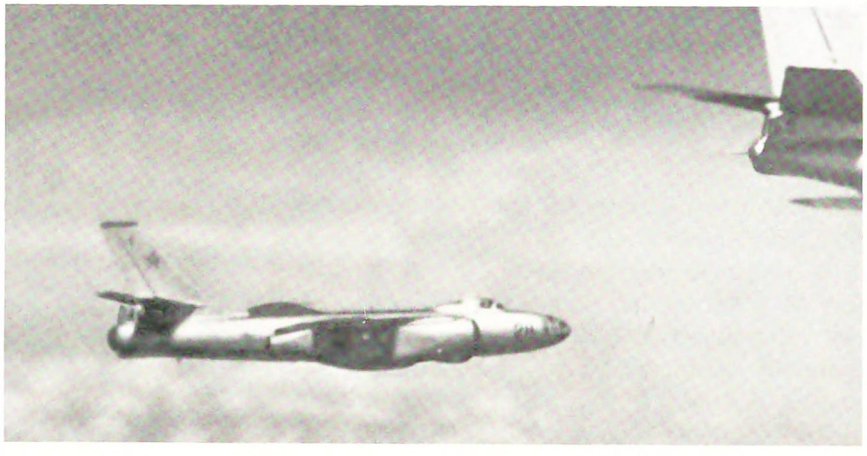
In late 1957 LII converted a Voronezh-built IL-28 coded '01 Red' (c/n 2402101) into a makeshift tanker trainer for testing a probe-and-drogue in-flight refuelling (IFR) system developed by OKB-918. An experimental winch emulating a hose drum unit (HDU) was installed in the bomb bay, paying out a 5-mm (0⅜ in) steel cable with a drogue of 640 mm (2 ft 1⅜ in) diameter to a point 42 m (137 ft) beyond the bomber's tail. Initially a 36-kg (79-lb) unstabilised drogue was used. Later, a second IL-28 mentioned in LII reports as 'IL-28LL No.418' (c/n ...418) was modified as a 'tanker' – this time with a real HDU known as KAZ (***kom**pleksnyy agre**gaht** za**prahv**ki* – integrated refuelling unit). It featured an

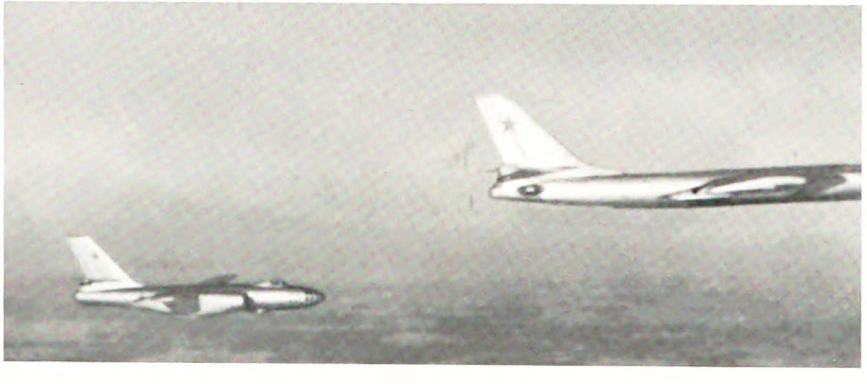
The IL-28U-LL, with a scrap view of the nose with the trainee's cockpit ready for a test ejection.











Left: LII's IL-28 '211 Blue' in echelon port formation with a Tu-16 during tests to determine the optimum refuelling formation and explore the tanker's wake vortex.

Below left and centre left: The same IL-28 in line astern formation with a Myasishchev M-4. The latter has the bomb bay doors open, as the M-4-2 tanker would when deploying the drogue.

Bottom left: '211 Blue' in line astern formation with the Tu-16 (representing a Tu-16N tanker).

experimental steerable drogue – a 60° cone of 600 mm (23⅝ in) diameter incorporating an annular rudder of the same diameter 100 mm (3¹⅞₆ in) wide mounted at 60 mm (2²³⁄₆₄ in) from the base and having deflection limits of ±14° in the horizontal and vertical planes; the drogue was controlled by means of a joystick in the gunner's station. The hose had a diameter of 65 mm (0²⁹⁄₆₄ in) and a length of 23 m (75 ft); it could be jettisoned in an emergency. Both types of drogue had a lock for engaging the probe.

LII test pilot Nikolai O. Goryaynov was appointed project test pilot of the 'tanker'. (It deserves mention that on 11th July 1955 he gained the distinction of being the first Soviet pilot to perform in-flight refuelling of a heavy bomber – a Myasishchev M-4 *Bison-A*.) On 28th August 1957 Goryaynov made a flight to check the operation of the winch; the drogue was deployed at an altitude of 7,000 m (22,965 ft) and 400, 450, 500 and 550 km/h (248, 279, 310 and 341 mph) IAS.

At first the 'tanker' worked with the tenth production Gor'kiy-built MiG-19 *Farmer-A* ('10 Red', c/n N59210110) which was likewise converted at LII in late 1957 for experimenting with IFR systems for tactical aircraft. The fighter had no fewer than four dummy IFR probes because the optimum location had to be determined experimentally. Probe 1 was a dog-leg tube attached to the port wing root (the port gun mount) so that the tip was level with the top of the canopy. It was located 0.55 m (1 ft 9²¹⁄₃₂ in) from the fuselage side, protruding 0.75 m (2 ft 5³³⁄₆₄ in) beyond the wing leading

Opposite page, clockwise from top left:

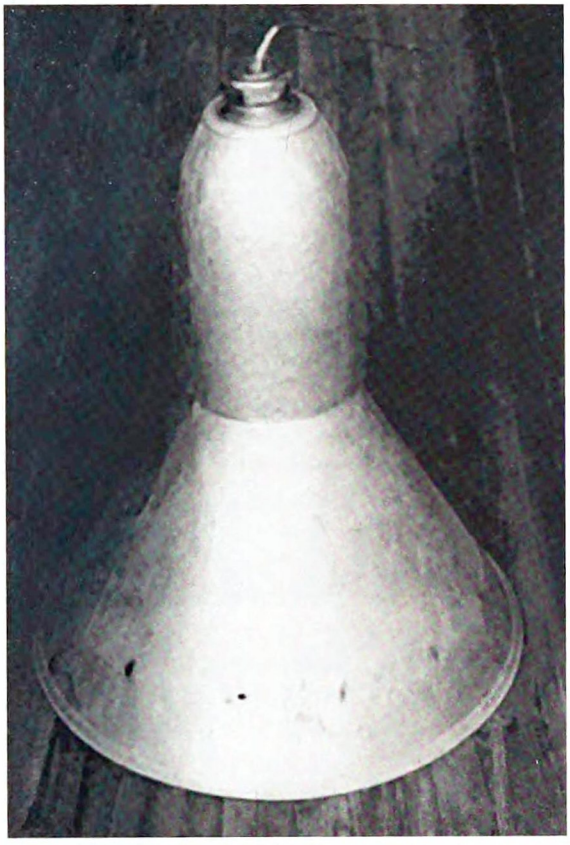
The original non-steerable drogue with its steel cable.

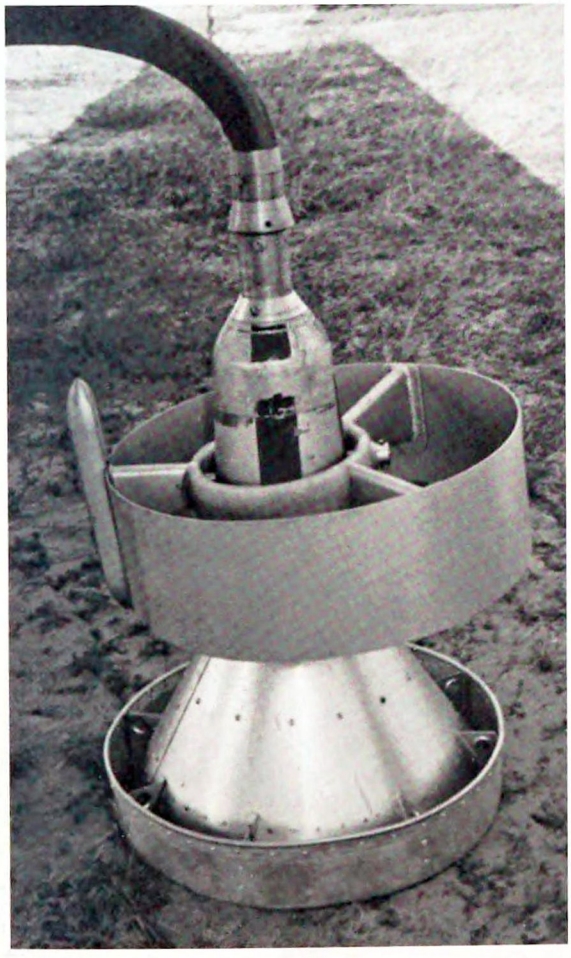
'IL-28 No.418' with the steerable drogue deployed on a hose. Note the cine cameras on the wings.

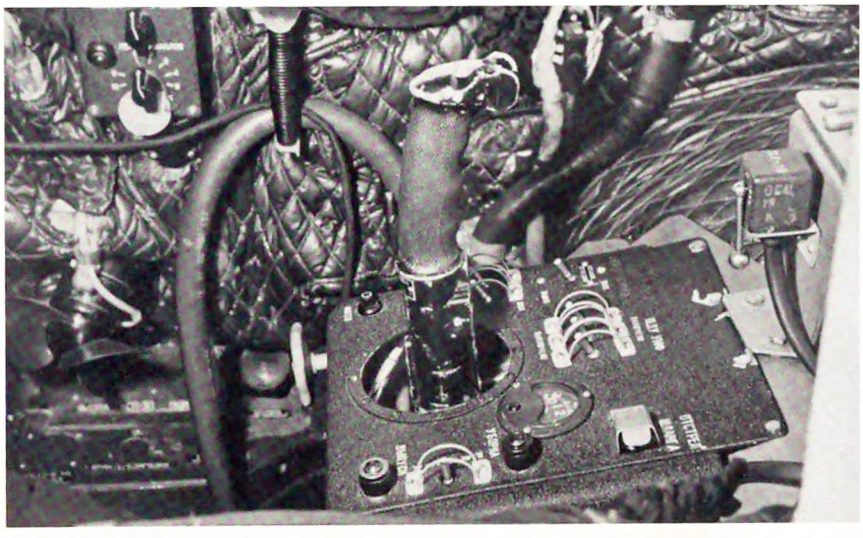
The drogue control panel in the gunner's station of the IL-28 'tanker' with a steering joystick and a guarded switch for emergency jettisoning of the hose.

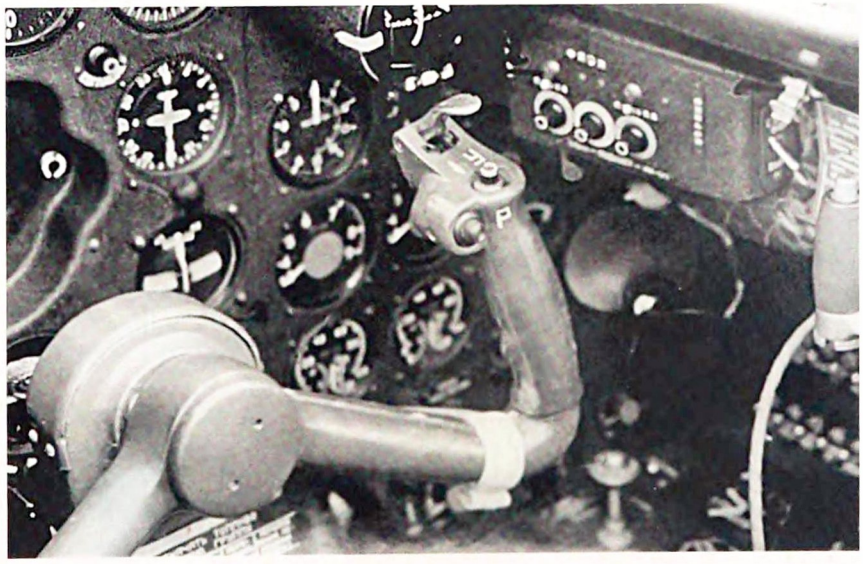
The control wheel of the IL-28 receiver aircraft with IFR probe control buttons on the right-hand horn.

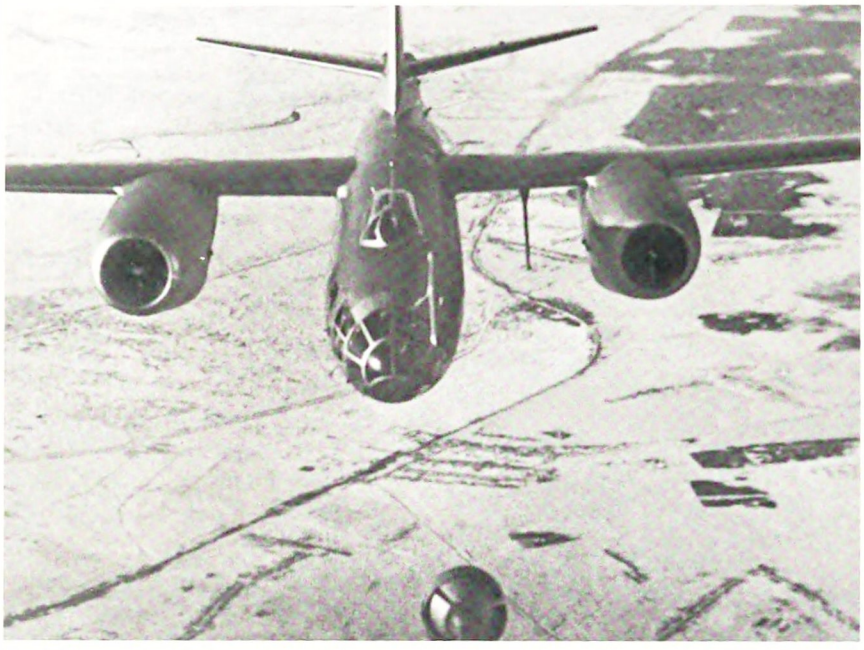
The steerable drogue with its annular rudder.

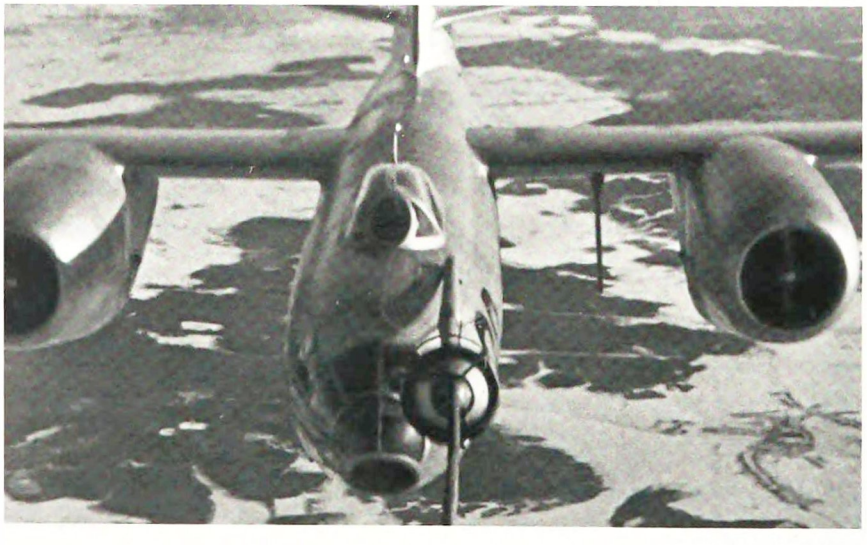












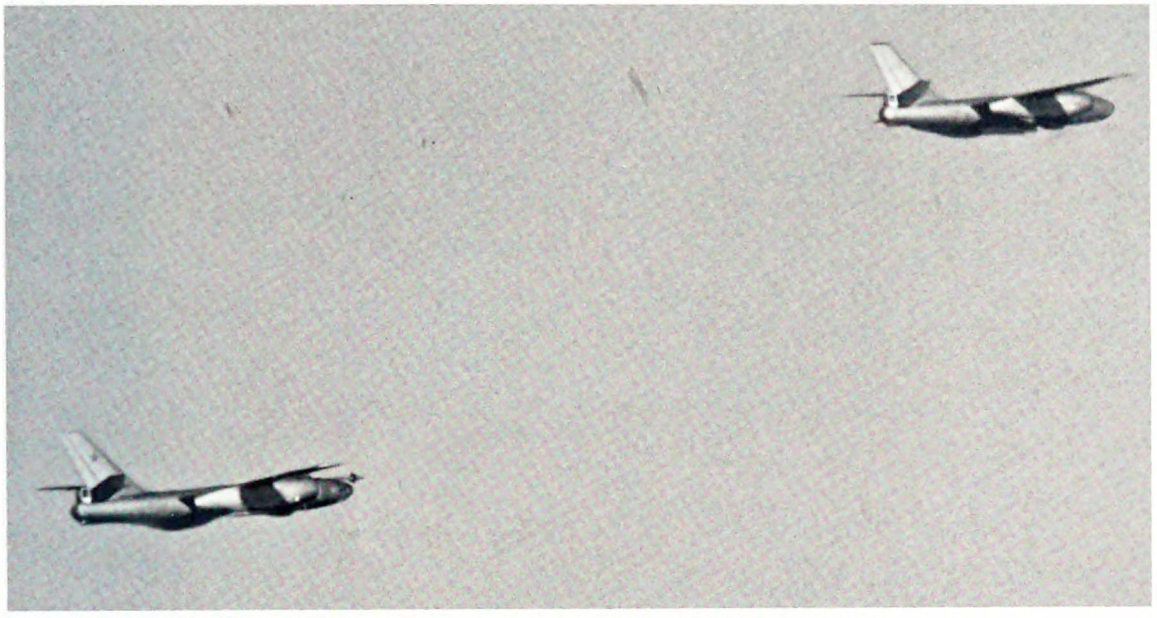
edge. Probe 2 was located on the fuselage nose, offset 0.25 m (9 27/32 in) to port and protruding 0.8 m (2 ft 7½ in) beyond the intake lip. The other two probes were attached to the port wing 1.05 m (3 ft 5 21/64 in) and 1.85 m (6 ft 0 53/64 in) from the fuselage side respectively. Probe 3 protruded 2 m (6 ft 6 47/64 in) beyond the wing leading edge and was located 1.8 m (5 ft 10⅞ in) from the intake; for probe 4 these parameters were 1 m (3 ft 3⅜ in) and 4 m (13 ft 1 31/64 in) respectively.

LII test pilots Stepan F. Mashkovskiy, Pyotr I. Kaz'min and Sergey N. Anokhin made ten 'refuelling' flights in the fighter – usually with drop tanks to increase mission time. All three pilots were familiar with the probe-and-drogue IFR system, having flown modified MiG-15*bis* fighters on test missions with a Tu-4 experimental two-point tanker in 1953. The IL-28 was flown by LII test pilot Vladimir M. Pronyakin; V. D. Koorbesov was the engineer in charge.

The MiG-19 made contact with the IL-28 at 4,000 m (13,120 ft) and 8,000 m (26,250 ft) at 450-470 km/h (279-291 mph) IAS, approaching from a stand-by position 10-20 m (32-65 ft) behind the drogue. Contact was usually made in a climb, with or without side slip; the approach speed varied from 0.3 to 12 m/sec (1-39 ft/sec). After making contact the fighter stayed locked into the drogue for three to five seconds, then slowed down and broke contact; for safety's sake the drogue lock was set at an unlocking force of 60-80 kg (132-176 lb). The tenth flight had to be cut short when the drogue was sucked into the fighter's air intake and collapsed, the debris damaging one of the engines.

The trials showed that the chances of making contact with the tanker depended mainly on the drogue's stability. The nose probe allowed the pilot to make contact relatively easily, providing approach speed was 0.3-0.5 m/sec (1-1.6 ft/sec). Making contact with the other probes was difficult if approach speed was less than 2 m/sec (6.5 ft/sec) and was largely a matter of chance, even though the steerable drogue facilitated it somewhat. The odds were better if the fighter approached at 7-12 m/sec (23-39 ft/sec) with sideslip, but this called for considerable flying skills. The tests also revealed certain deficiencies of the steerable drogue's control mechanism (insufficient control authority and inadequate strength of the parts). Anyway, IFR capability was considered more important for long-range bombers than for fighters, and the experiments were abandoned.

Later 'IL-28 No.418' was involved in experiments where another *Beagle* was the receiver aircraft (see next entry). The tests of a non-functional automated IFR system on this aircraft proceeded in 1958-59. In similar manner to the IL-28LL ejection seat testbeds, the tanker had wing-mounted cine cameras to record the contact with the receiver aircraft; further cameras were mounted instead of the tail cannons.

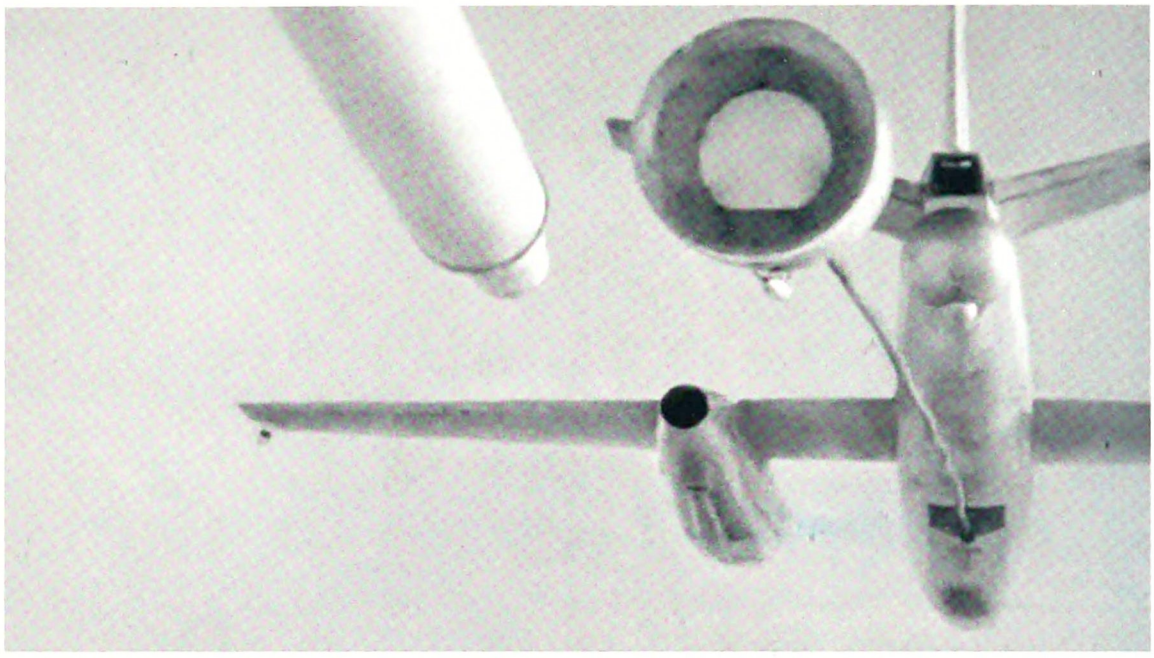


The probe-equipped IL-28 coded '08 Red' in a simulated refuelling formation with the IL-28 'tanker', which in this case tows the non-steerable drogue on a cable.

Filmed from a chase plane, IL-28 '08 Red' is shown with the telescopic IFR probe in normal position...

...and fully extended position.

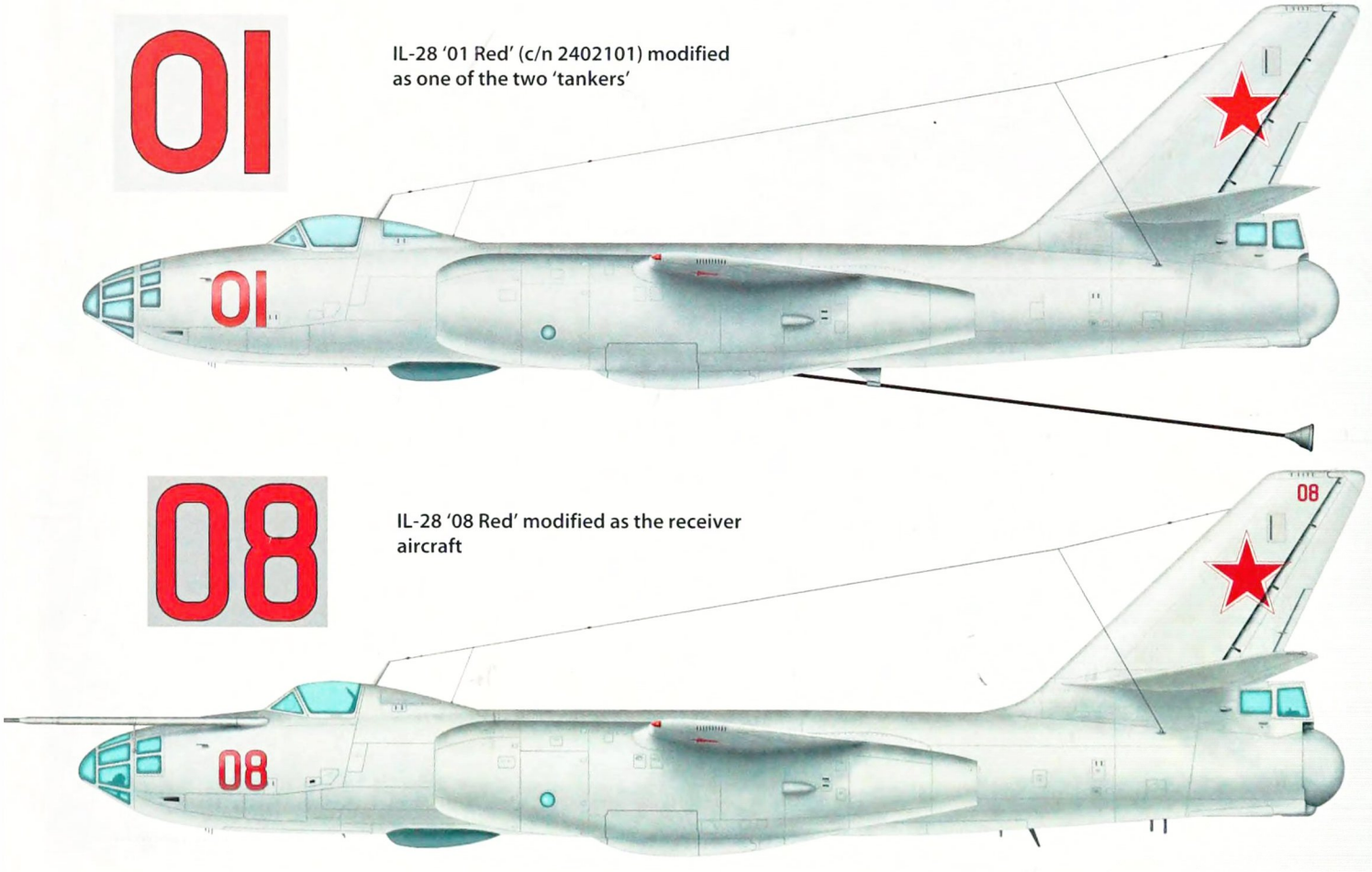
Opposite page: Stills from movie footage shot by the IL-28 tanker's refuelling systems operator, showing '08 Red' approaching and making contact with the steerable drogue. Note the additional pitot on the receiver aircraft's port wing.



A view from the navigator's station of '08 Red' as the aircraft approaches the steerable drogue and prepares to 'fire' the probe into it. Note the tanker's bomb bay doors cut away at the rear to enable operation of the HDU.

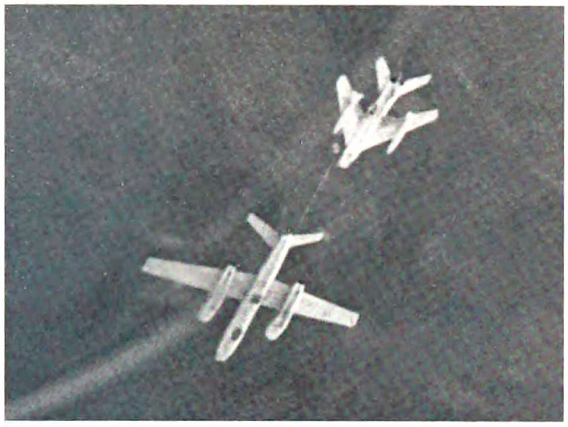
IL-28 receiver aircraft with IFR probe

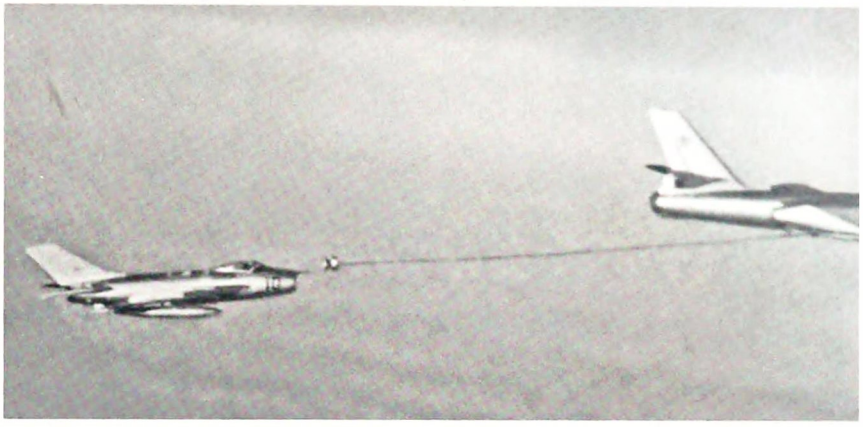
In due course the Soviet military put forward more stringent requirements which the IL-28 could no longer meet; one of the *Beagle*'s greatest deficiencies was inadequate range. However, at that point it was deemed inexpedient to retire the many IL-28s in VVS service, so someone suggested retrofitting the bombers with the probe-and-drogue IFR system. To this end an IL-28 coded '08 Red' (c/n ...08) was fitted with a fixed refuelling probe offset to port and



IL-28 '01 Red' (c/n 2402101) modified as one of the two 'tankers'

IL-28 '08 Red' modified as the receiver aircraft





Above and above left: The modified MiG-19 '10 Red' makes contact with the IL-28 'tanker'.

Simulated refuelling flights of MiG-19 c/n N59210110 and the IL-28 'tanker'

Flight	Date	MiG-19 pilot	Successful attempts
No.1	18-9-1957	Stepan F. Mashkovskiy	2 of 4 (nose probe)
No.2	20-9-1957	Stepan F. Mashkovskiy	2 of 7 (nose probe)
No.3	24-9-1957	Stepan F. Mashkovskiy	2 of 5 (nose probe)
No.4	27-9-1957	Stepan F. Mashkovskiy	No contact
No.5	3-10-1957	Stepan F. Mashkovskiy	1 of 33
No.6	16-10-1957	Sergey N. Anokhin	2 of 41
No.7	30-10-1957	Stepan F. Mashkovskiy	1 of 12
No.8	1-11-1957	Stepan F. Mashkovskiy	2 of 34
No.9	7-12-1957	Pyotr I. Kaz'min	9 of 30
No.10	27-12-1957	Pyotr I. Kaz'min	No contact

supported by an inverted-V brace above the navigator's station.

The two aircraft made successful contacts, using both the non-steerable and steerable versions of the drogue. However, the system was not fitted to Soviet Air Force IL-28s because Aleksandr S. Yakovlev's OKB-115 brought out the more promising Yak-129 supersonic tactical bomber which eventually entered production and service as the Yak-28.

Though not actually equipped with a refuelling receptacle, another IL-28 serialled '211 Blue' (c/n ...211) deserves mention here because it contributed to the development of IFR techniques. It was used in simulated refuelling sessions, flying in line astern formation with a Tu-16 in early 1954 and an M-4 in the autumn of 1954 (emulating the Tu-16N *Badger-A* and M-4-2 single-point hose-and-drogue tankers respectively) to determine the optimum position in which the receiver aircraft would be least affected by the tanker's wake turbulence. LII test pilot Arkadiy P. Bogorodskiy made two flights with the M-4, maintaining a horizontal separation of 100, 80, 50, 30, 20 and 10 m (approximately 330, 260, 160, 100, 65 and 30 ft). The first sortie was flown at 8,850 m (29,040 ft) and the second at 8,300 m (27,230 ft); the IL-28 approached at 20-25 m (65-80 ft) below the lead aircraft's flight level, then slowly climbed until the buffet from the M-4's wake vortex was felt. Each of the relative positions of the two aircraft was maintained for five minutes to emulate fuel transfer and was filmed from a chase plane. It was established that the receiver's optimum position was 8-12 m (26-40 ft) below the tanker and 5-30 m (16-100 ft) behind it.

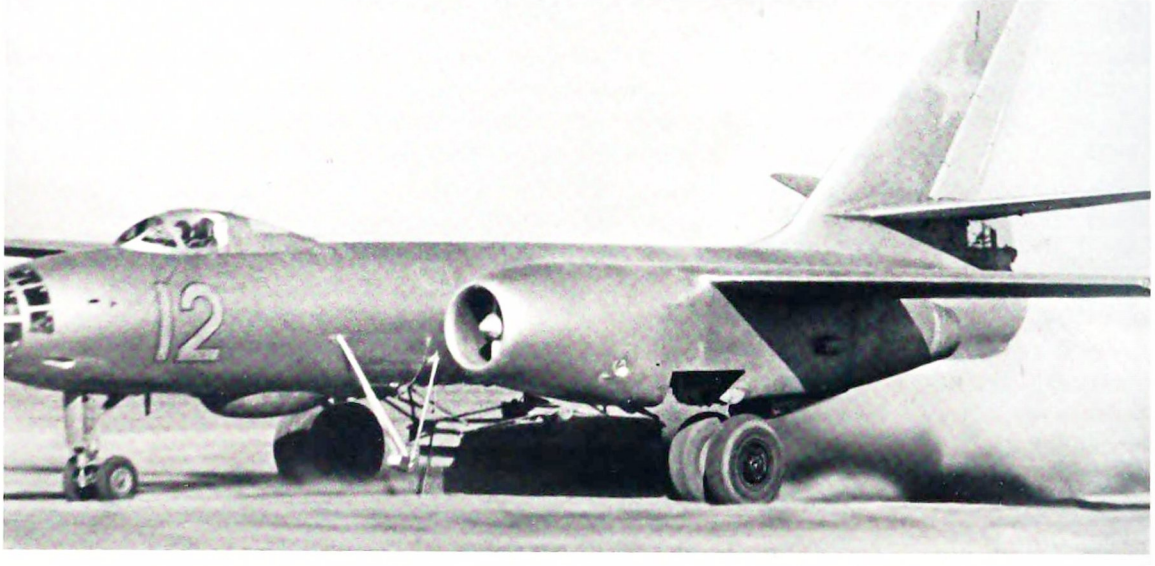
4. Landing gear testbeds

IL-28LSh landing gear testbed

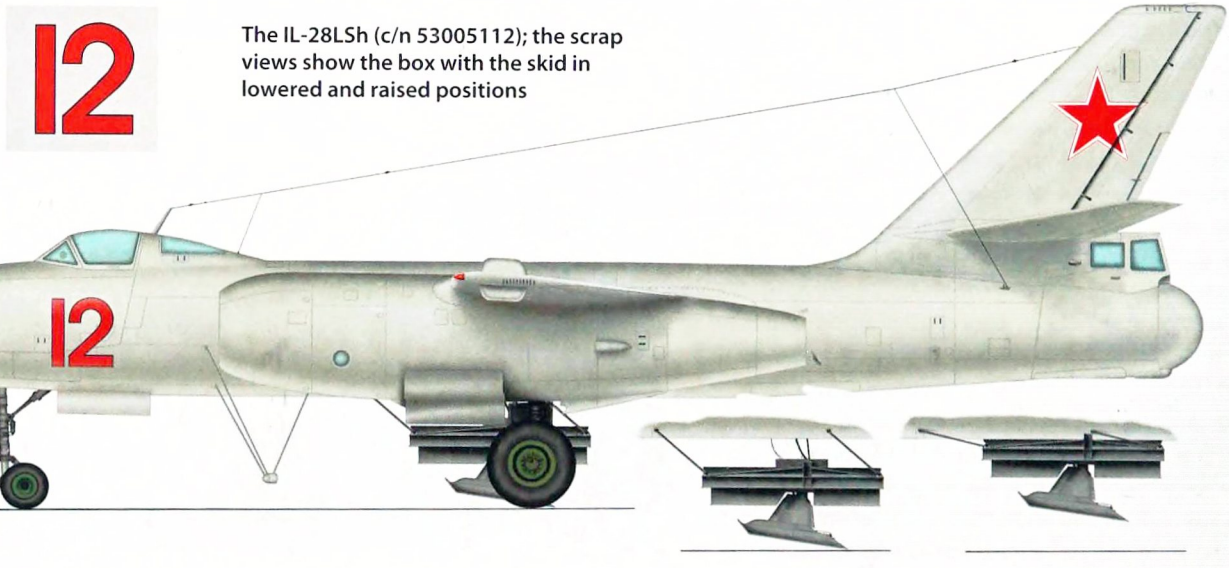
In 1958 the Ilyushin OKB converted a Moscow-built IL-28 coded '12 Red' (c/n 53005112) into the IL-28LSh

The IL-28LSh ('12 Red') was used to test the efficacy of a skid landing gear that would enable tactical aircraft to operate from soft or soggy strips. The skid was mounted on a box attached on parallel sets of trailing arms and raised or lowered as required by a hydraulic ram; here it is fully lowered. Note the fixed landing gear with twin wheels on the main units and no wheel well doors.

Front view of the same aircraft, showing the modified nose gear unit with wide-track wheels. The object on a strut aft of the port main gear unit appears to be a cine camera filming the skid.



On dirt strips the IL-28LSh kicked up a lot of dust! Note the cine camera mounted on a truss ahead of the port engine.



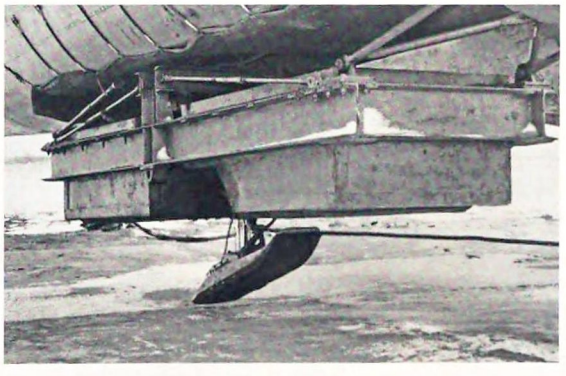
The IL-28LSh (c/n 53005112); the scrap views show the box with the skid in lowered and raised positions

Here the IL-28LSh is seen on a snow-covered field.

Another view of the IL-28LSh in action.

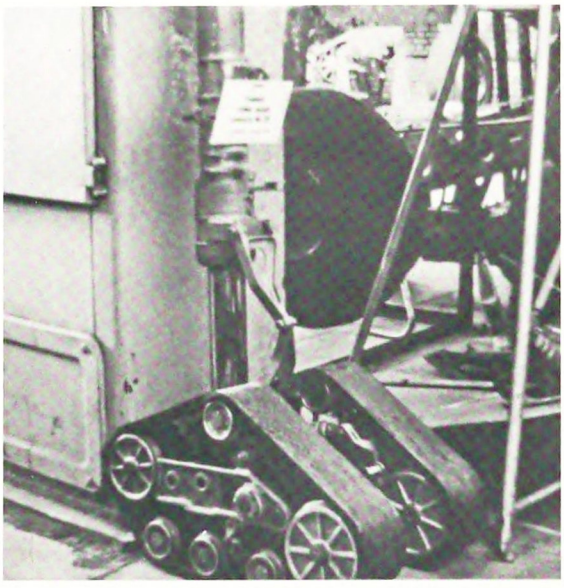
(***lyzh****noye shas****see*** – ski landing gear) for testing the efficiency and durability of aircraft skids designed for unpaved tactical airstrips. The aircraft was fitted with a sprung skid which was rigged with pressure sensors and mounted on a hollow box below the bomb bay (the bay doors were removed). This box could be filled with ballast, altering the loads the skid was subjected to. The whole assembly was mounted on two pairs of trailing arms with stiffening cross-braces and was raised and lowered by a hydraulic ram.

The nose gear unit had widely-spaced wheels and the main units had twin wheels. This modified undercarriage was fixed, so the mainwheel well doors were deleted to avoid fouling the wheels, as were the nosewheel well clamshell doors. A cine camera was mounted low on the port side of the forward fuselage on a tripod-like truss to record the motion of the skid over the ground; another camera was attached to the inboard side of the port engine nacelle. The skid was tested on airstrips with various bearing strength in different seasons; the IL-28LSh made high-speed runs but did not become airborne.



Close-up of the box in the fully raised position. The box could be filled with ballast to simulate various loads. Note the skid's shock absorber and the canvas cover (held in place by straps) preventing dirt from entering the bomb bay – no vain precaution.

Curiously, one Russian publication asserts that the IL-28 used for skid landing gear tests in 1953-57 and



One of the tracked main gear units tested on the IL-28, seen here as a teaching aid at the Moscow Aviation Institute.

1978-79 (!) was 'No.710' (that is, c/n 53005710). This is obviously wrong, as this aircraft was the IL-28LL ejection seat testbed from 1953 onwards.

IL-28 tracked landing gear testbed

To enhance the IL-28R's ability to operate from tactical airfields a special tracked landing gear was developed and tested pursuant to a Council of Ministers directive dated 11th January 1951. It allowed the bomber to operate from soft, soggy or snow-covered airfields which rendered take-off with a conventional landing gear difficult or impossible.

The experimental landing gear was designed by engineers Basht and Golubkov at plant No.279, being fitted to an unidentified IL-28. Each main gear strut had twin track modules looking remarkably similar to the modern commercial products offered by such companies as Mattracks or Wheeltracks for installation instead of wheels to turn SUVs or trucks into all-terrain vehicles. Each module had a rubber tread stretched in a pentagon shape over six rollers – a large rear wheel, a smaller front wheel, three even smaller road wheels and one supporting roller of the same size at the top.

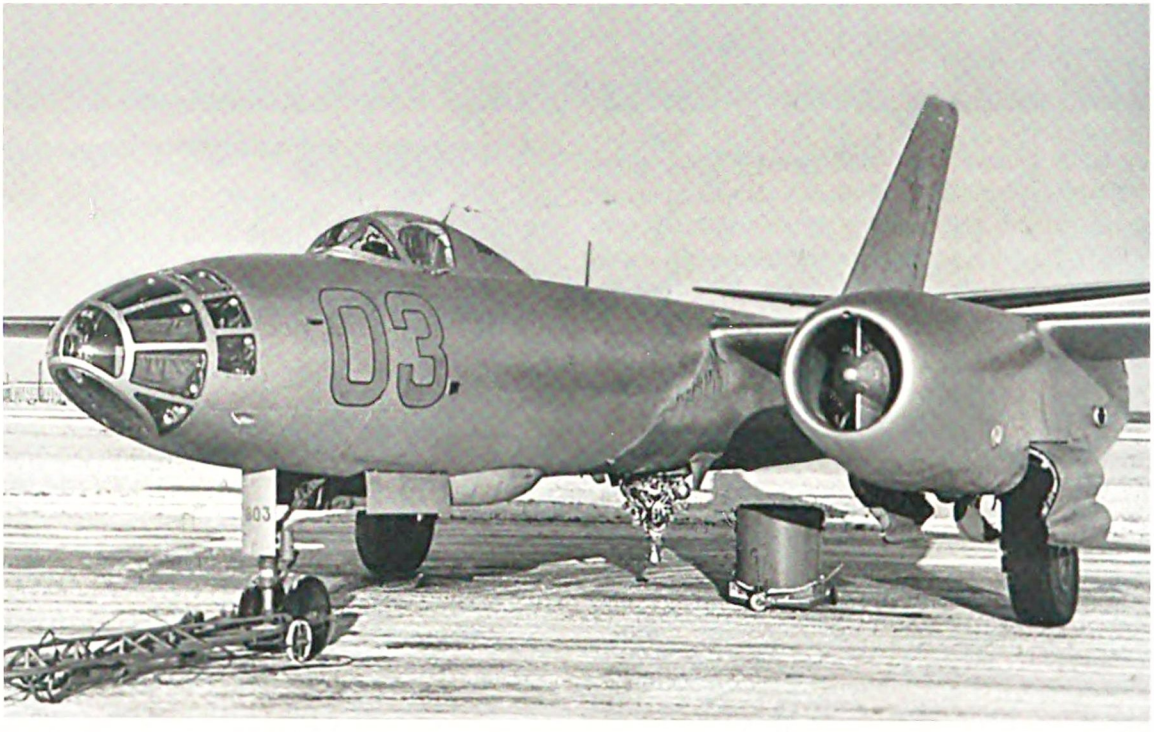
The tracked gear was to pass state acceptance trials in December 1952; initial tests gave encouraging results but the work was never completed. Owing to the extra weight and complexity of the design, it was not retrofitted to production IL-28Rs. The tracked main gear struts were later transferred to the Moscow Aviation Institute (MAI) as teaching aids.

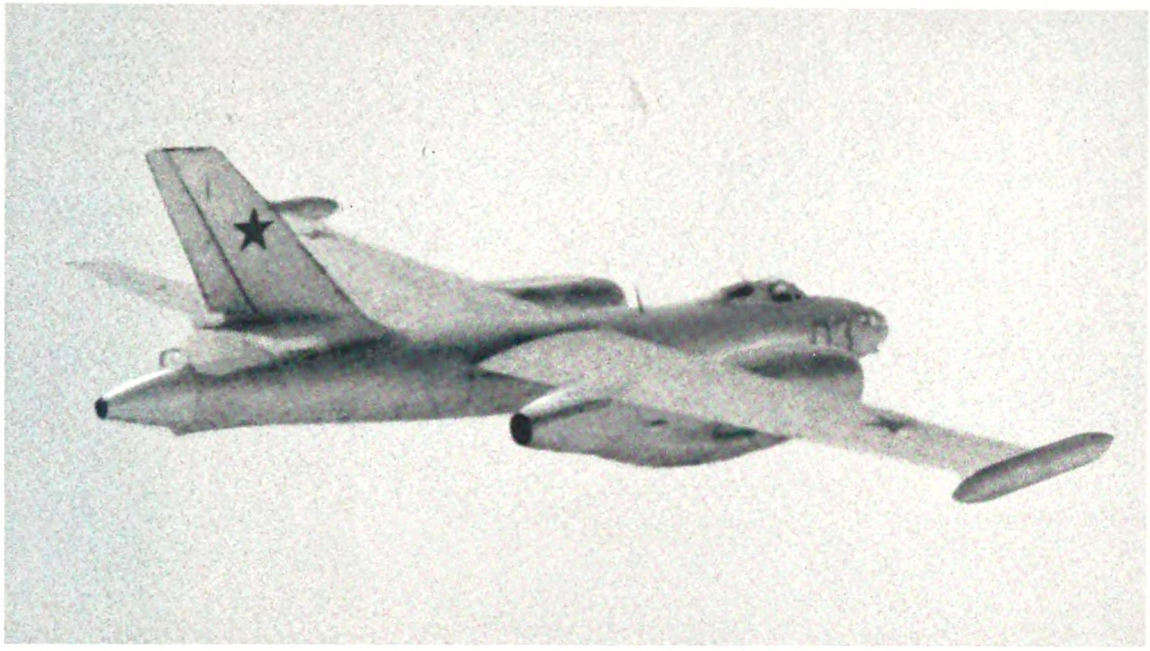
5. Engine testbeds

Soviet IL-28R rocket motor testbed

An IL-28R coded '03 Red' (ex-'803 Red', c/n ...803) was modified by LII to test two liquid-propellant rocket motors developed by Leonid S. Dooshkin. The first of these was the 3,800-kgp (8,380-lbst) S-155 designed for the Mikoyan Ye-50 experimental mixed-power high-altitude interceptor, where it was installed at the base of the fin above the Tumanskiy R11F-300 afterburning turbojet. The other was the 4,000-kgp (8,820-lbst) RU-013, which was the core of the U-19D booster pack that found use on the Mikoyan SM-12PMU experimental high-altitude interceptor. Both models ran on special TG-02 fuel (***top****livo ghipergo****lich****eskoye* – hypergolic or self-igniting fuel), a 50/50 mixture of xylidine and

IL-28R '03 Red' was used in 1957 to test a liquid-propellant reaction control thruster for spacecraft that was mounted vertically in the bomb bay. The thruster is seen here with the cowling removed and placed on a dolly. Note the discoloration of the fuselage underside caused by firing the rocket motor.





Here the same aircraft is seen in a different configuration with an RU-013 liquid-propellant rocket booster replacing the tail turret.

A still from a cine film showing the RU-013 booster being ignited in flight. Note the shock diamonds in the rocket motor flame.

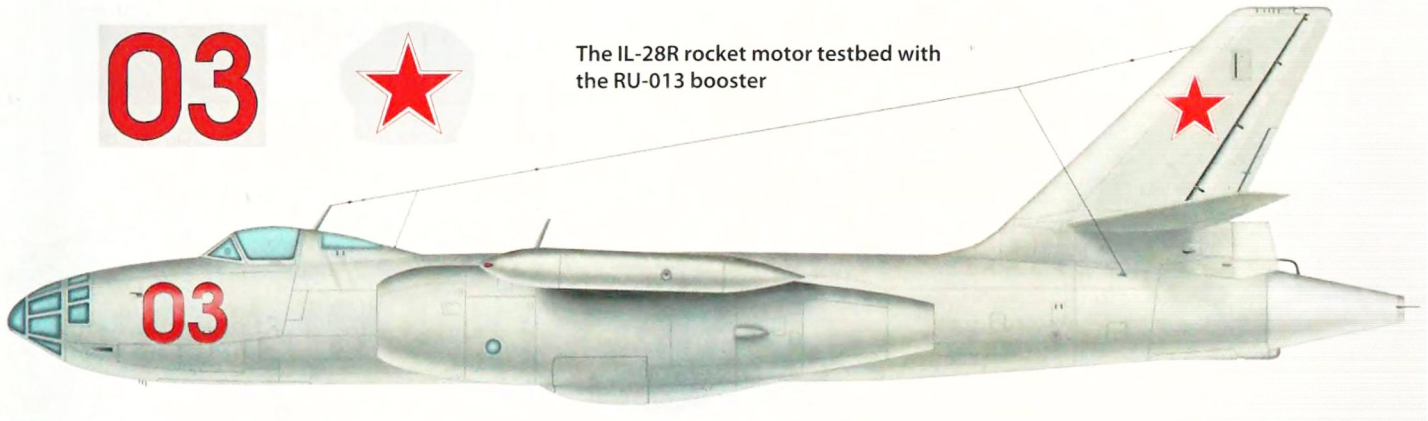
triethylamine which self-combusted when combined with AK-20 oxidiser (AK = ***azot****naya kislo****ta*** – nitric acid). Grade T hydrogen peroxide was used to work the turbo pump feeding the fuel and oxidiser to the rocket motor.

The experimental powerplant was installed in a short fairing shaped like a cropped cone supplanting the gunner's station. The tests took place in 1953-57; the testbed was flown by LII test pilot Pyotr I. Kaz'min, with V. I. Baranov as engineer in charge.

Later in 1957, the same aircraft was used for testing a different liquid-propellant rocket motor – a reaction control thruster designed for Soviet spacecraft, to be used for manoeuvring in orbit. This time the rocket motor was disposed vertically below the bomb bay, which accommodated the fuel and oxidiser tanks, and was enclosed by a cylindrical housing.

IL-28R – East German engine testbeds

Few remember nowadays that East Germany had an aircraft industry of its own. Besides building the Ilyushin IL-14P *Crate* piston-engined airliner under licence in Dresden, the Germans designed their own aircraft as well. In the early 1950s the aircraft designer Carl Wilhelm Brunolf Baade started work on the Type 152 (or simply '152') – a 72-seat medium-haul airliner. In Western publications the aircraft is often called BB 152 (in an obvious reference to Brunolf Baade) or VEB-152; the



The IL-28R rocket motor testbed with the RU-013 booster

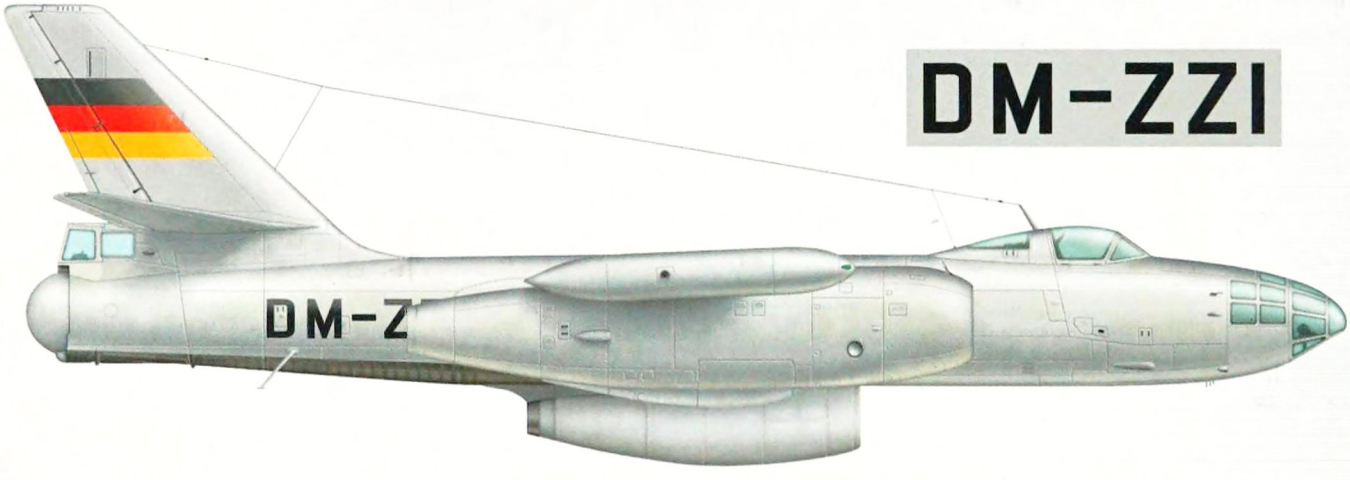
Already registered DM-ZZI, the first of the two East German engine testbeds is shown here at Leipzig-Schkeuditz immediately after delivery (prior to conversion by MAB Schkeuditz) in 1958. The radome is still there, but the tip tanks characteristic of the IL-28R are missing. Note the old-style flag identical to the West German one.

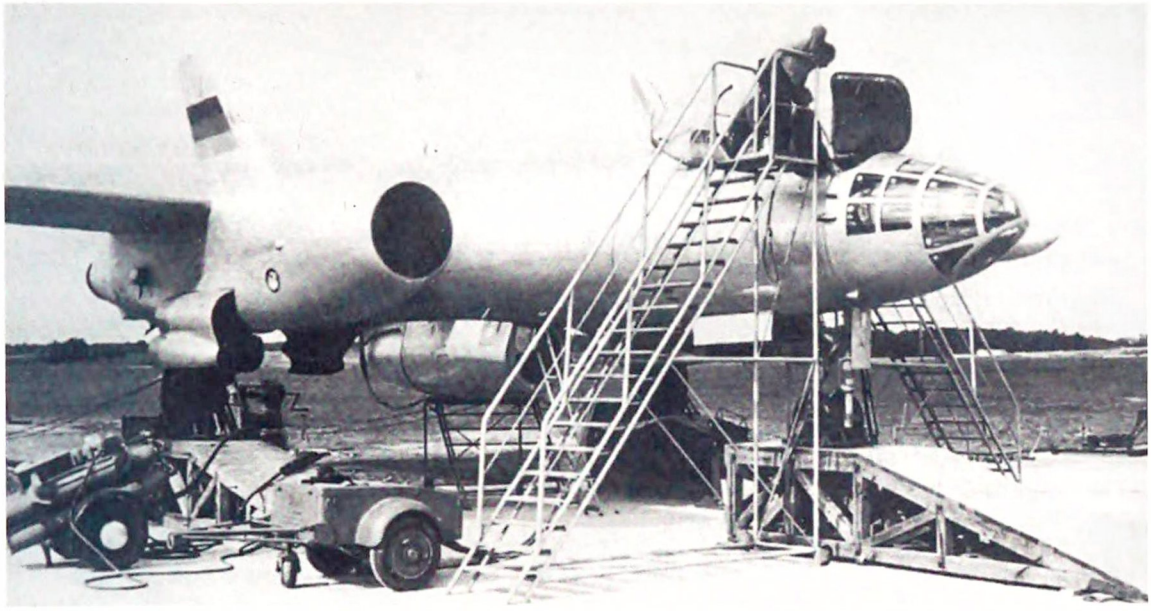
latter is nonsense, as the German acronym VEB denoting *Volkseigener Betrieb* – 'people's enterprise' (as opposed to a capitalist private enterprise!) – was the standard prefix of all company names in East Germany. However, (former) East German sources refer to the aircraft simply as the 152. In fact, the prototypes should have been designated EF 152 (for *Entwicklungsflugzeug* – development aircraft), in keeping with the traditions of Junkers AG where Baade had once worked, but this designation was not taken up.

The '152' was designed around four indigenous Pirna 014 axial-flow turbojets rated at 3,150 kgp (6,940 lbst) apiece for take-off; the engine had a 12-stage compressor, a can-annular combustion chamber and a two-stage turbine. Development of this engine at VEB Entwicklungsbau Pirna (Pirna Development & Manufacturing) in Pirna-Sonnenstein began in 1955, and the first prototype (the Pirna 014 V1; V = *Versuchsmuster* – test article) was bench-run for the first time on 12th October 1956. As the flight test stage approached, a suitable flying testbed had to be chosen. The Tu-4 was considered at first but was quickly rejected – it did not have the required speed, and spares for it (particularly the Shvetsov ASh-73TK radial engines) were becoming increasingly difficult to obtain. Hence the choice fell on the IL-28, which was fast enough.

DM-ZZI, the first of two East German IL-28Rs used as testbeds for the Pirna 014 turbojet.

VEB Entwicklungsbau Pirna bought an IL-28R (c/n 41418) and had it converted into an engine testbed. The reconnaissance version was chosen because of the greater fuel capacity and the stronger landing gear – a

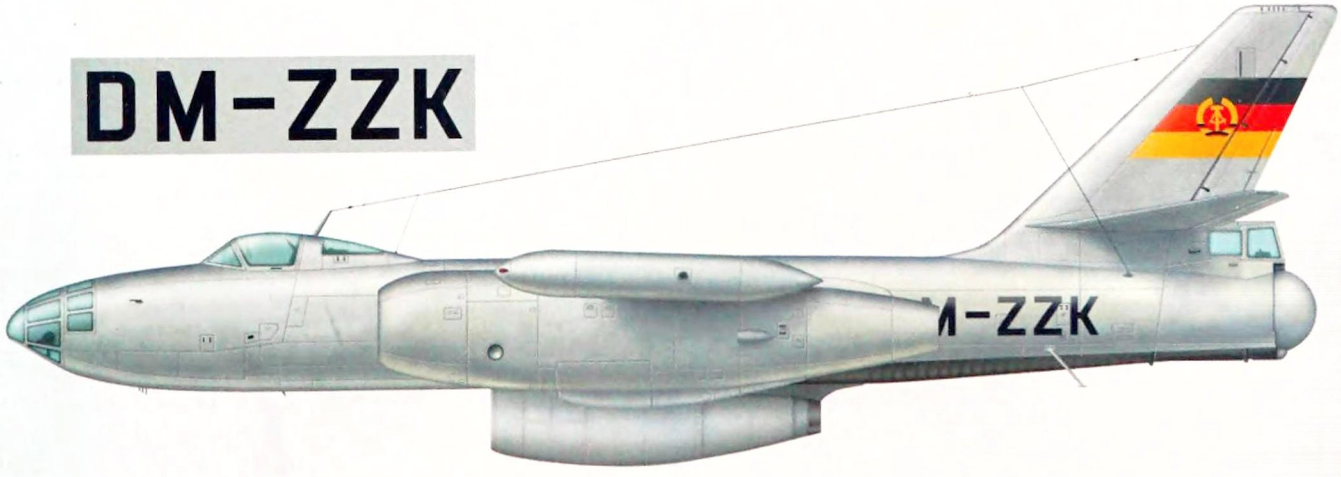


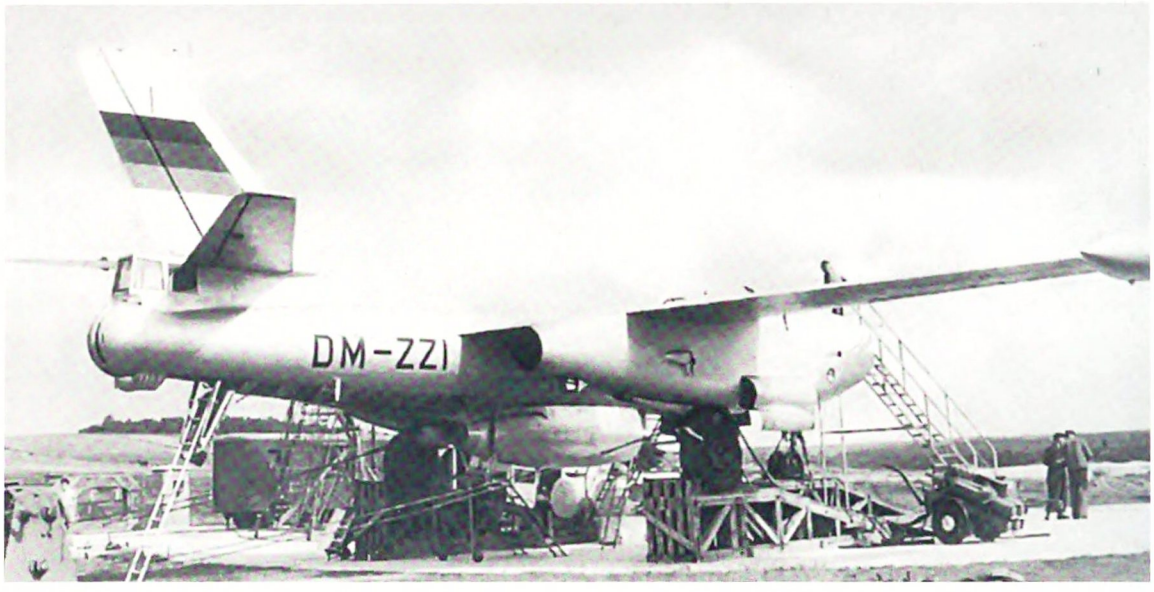


DM-ZZI is prepared for a ground run of the Pirna 014 engine at Dresden-Klotzsche, with an air cart and a battery cart connected. The aircraft is parked on special ramps to increase the engine's ground clearance to that of the 152 airliner.

Here, a ground run is due to take place without the special ramps. The test engine is uncowled; a tarpaulin secured by metal weights has been spread on the ground under it and sprayed with water in an effort to reduce the risk of FOD.

DM-ZZK, the second East German engine testbed. Note the revised flag introduced in late 1960.





Another view of DM-ZZI on the ramps before a ground run. Tall ladders were required to board the aircraft. Note the tethering cables.

useful feature, since the engine alone weighed 1,060 kg (2,340 lb), not including the test instrumentation. The aircraft was delivered *sans* radar and armament and placed on the East German civil register as DM-ZZI (the DM-Zxx registration block was reserved for industry-operated aircraft). Curiously, as was the case with all East German civil aircraft at the time, the flag on the tail was identical to that of West Germany (the elaborate coat of arms in the centre of the otherwise identical East German flag was not introduced until late 1960).

The conversion job was undertaken by MAB Schkeuditz (Maschinen- und Apparatenbau – Machinery & Instrument Manufacturing Enterprise) at Leipzig-Schkeuditz airport. The experimental engine

In this photo of IL-28R DM-ZZI showing the engine's intake shutter closed, the East German coat of arms has been retouched into the flag (with a bit of tilt) because someone decided that the 'West German' flag is improper!

A further view of DM-ZZI; note that the cannon travel slots have been retouched away!

DM-ZZK, the second East German testbed, sometime after June 1960 with the Pirna 014 V20 installed. The fully deployed flaps suggest the aircraft has just landed after a test flight. Note the revised flag.

was housed as close as possible to the aircraft's CG in a large nacelle under the centre fuselage (called *Tropfen*, 'drop [of water]', in local slang) between fuselage frames 18-29, which took up the entire length of the bomb bay; the bay doors were suitably cut away to fit around it. To prevent FOD on take-off/landing and windmilling during cruise the air intake was closed by a hydraulically-actuated shutter at frame 18 which the test engineer could open or close by means of a hand-driven pump at up to 350 km/h (217 mph). The lower lip of the intake was flattened, resulting in a shape not unlike that of the CFM56 engines' nacelles on the Boeing 737-300/-400/-500 series; this was probably caused by the shape of the shutter rather than by inlet aerodynamics. The entire fuselage underside aft of the development engine was covered by a heat-resistant compound to protect the duralumin skin from the jet blast.

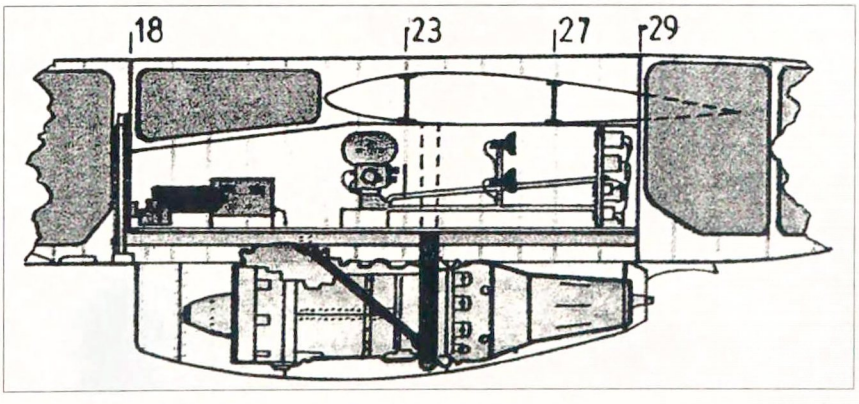
The bomb bay housed the engine's priming tank and test instrumentation – a data recorder (frames 18-20), an instrument panel at frame 28 and an AK 8 or AK 16 remote-controlled cine camera (or a still camera) between frames 21-23, with appropriate lighting at frames 25-26, to film the instrument readings. The navigator was exiled to the gunner's station from which he kept an eye on the test engine via forward-view mirrors under the tailplanes, watching out for a possible fire, fuel leaks etc. The regular navigator's station now accommodated the test engineer, the Pirna 014's controls (starting panel and throttle) and more instruments. One of the fuselage fuel tanks had to be removed, but the wingtip fuel tanks made up for this.

Thus, the so-called External Test Section (*Abteilung Außenerprobung*) of VEB Entwicklungsbau Pirna came to include the *Gruppe IL-28*. The latter's responsibilities included performance testing at altitudes up to 12,500 m (41,010 ft) in 500-m (1,640-ft) increments and

DM-ZZK climbs away from Dresden-Klotzsche with the development engine's intake shutter still closed.

speeds up to the IL-28's design limit of Mach 0.78. Flight idling rpm and windmilling rpm at various speeds and altitudes were to be determined, relight possibilities at up to 12,000 m (39,370 ft) and the inclination to surge in different flight conditions checked, icing tests and ground noise level measurements made.

The first flight-cleared engine (the Pirna 014 V9) was fitted to DM-ZZI in 1959. For ground runs, the aircraft was wheeled on to special elevated supports to minimise FOD risk. Finally, on 11th September the aircraft made its first test flight from Dresden-Klotzsche airport, which was also the seat of the Dresden aircraft factory No.803 (FWD – VEB Flugzeugwerke Dresden).



A drawing of the East German testbeds' centre fuselage showing the Pirna 014 engine on a strut-braced annular bearer, the priming tank and the test equipment (including the cine camera filming the engine instruments).

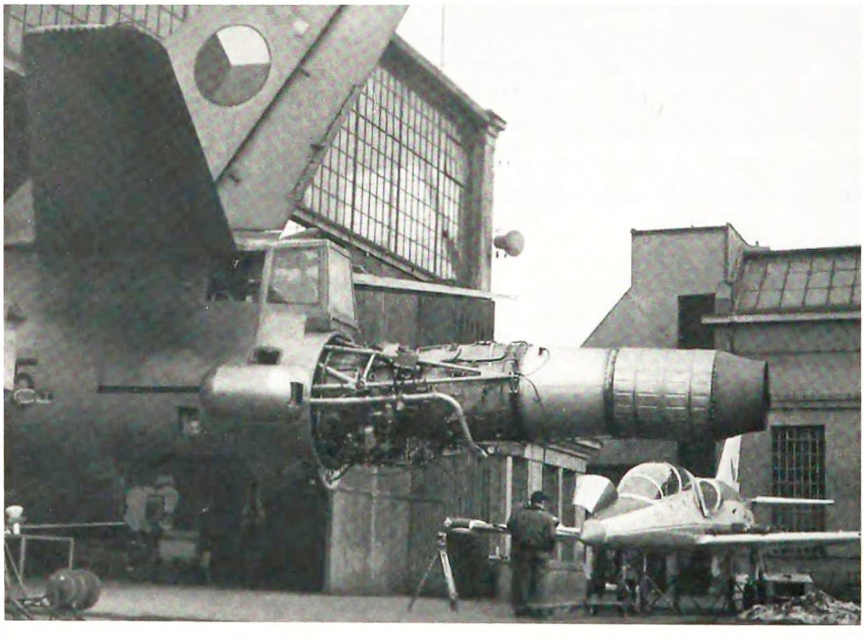
Another view of DM-ZZK retracting the landing gear as it departs Dresden on a test mission.

Opposite page: IL-28 '6915', the Czechoslovak engine testbed, at Prague-Kbely in late configuration with the AI-25TL development engine. Note the ventral air intake.

Below: The same aircraft at Kbely in 1968 with the AI-25TL uncowled and some sort of additional equipment on the port side of the gunner's station. Note one of the Aero L-39C prototypes in the background.

Flights were made in a racetrack pattern between the towns of Pulsnitz and Stolpen in the north-east (near the outer marker beacon of Dresden-Klotzsche) and the towns of Flöha and Zschopau in the south-west (near Karl-Marx-Stadt, now called Chemnitz). The distance between the turning points of the pattern was 60 km (37.2 miles). For safety reasons the development engine was always started at altitudes in excess of 600 m (1,970 ft). The testbed's performance and handling differed little from that of a standard IL-28, except that with the Pirna 014 running at full power the rate of climb increased to 35 m/sec (6,890 ft/min). In level flight at 10,000 m (32,810 ft) the testbed reached speeds of nearly 900 km/h (559 mph), so the main engines had to throttled back so as not to exceed the Mach limit.

DM-ZZI made a total of 109 test flights; the last of these took place on 22nd February 1961 with a production-standard Pirna 014A-1 built at Ludwigsfelde (c/n L10009; the L stood for Ludwigsfelde). Technically the tests went well – in fact, the engine performed rather better than expected. However, the programme was taking rather longer than anticipated; to widen the scope of work and expedite the tests another IL-28R (c/n 5901207) was obtained from the Soviet Air Force and converted into an identical testbed registered DM-ZZK. This aircraft made 102 flights between 26th February 1960 and 12th (some sources say 20th) June 1961; the last flight was with the Pirna 014 V28 pre-production engine. Other examples of the engine installed on the two aircraft included the Pirna 014 V20 (the first Pirna 014A-1) and the Pirna 014 V22.



Meanwhile, the airliner's first prototype, the bicycle-gear 152 V1 registered DM-ZYA, was rolled out at Dresden-Klotzsche on 30th April 1958. On 4th December the aircraft made its first flight, powered by Mikulin RD-9B turbojets since no flight-cleared Pirna 014 engines were available yet. Three months later, on 4th March 1959, the airliner crashed due to a fuel system defect, killing the crew. The much-modified second prototype, 152/II V4 (DM-ZYB) powered by Pirna 014A-1 engines and equipped with a tricycle landing gear, flew on 26th August 1960; the defect (inadequate venting of the fuel tanks that could cause fuel delivery to stop) was soon discovered during defuelling tests and could be easily rectified. The third prototype, 152/II V5 (DM-ZYC), was completed in due course and the first 28 production aircraft were in various stages of completion at FWD.

Then the East German government lowered the boom. It had long considered the local aircraft industry unprofitable, and in late November 1960 it decided to eliminate the industry altogether. Big Brother would supply East Germany with all the aircraft she needed anyway. By mid-1961 the BB 152 was abandoned, all the aircraft being scrapped (only a single fuselage survived and was later restored for static display); this also spelled the end for the Pirna 014 engine. Well, politics are always intruding into aircraft industry affairs – sometimes against common sense and even to the detriment of national interests. The Yakovlev Yak-30 *Magnum* advanced trainer and Beriyev Be-30/Be-32 *Cuff* 17-seat feederliner were similarly victimised by the Council for Mutual Economic Assistance (COMECON) 'strategists' in the mid-1960s, even though they were at least as good as their Czechoslovak counterparts – the Aero L-29 Delfin (Dolphin; NATO *Maya*) and Let L-410 Turbolet, which were ordered for the Soviet Air Force and Aeroflot respectively.

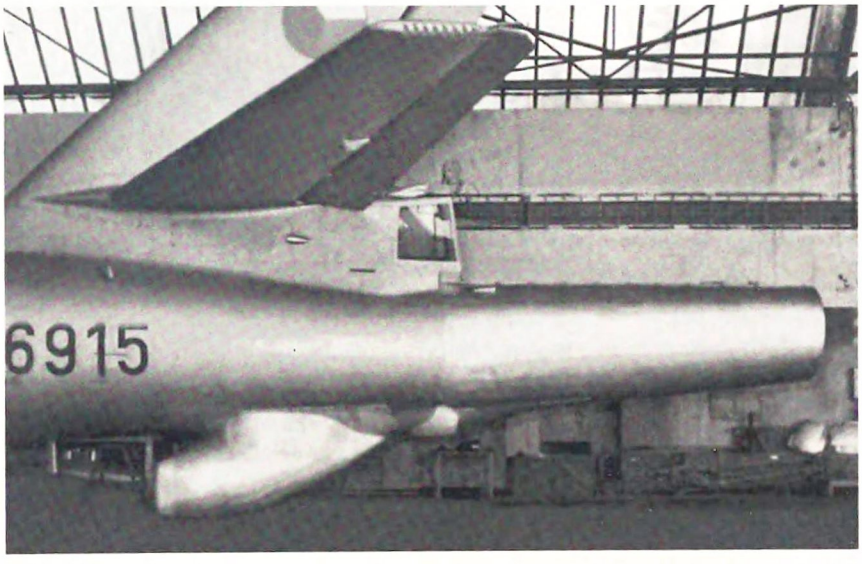
As for the testbeds, DM-ZZI and DM-ZZK were reconverted to IL-28R standard and delivered to the East German Air Force as 180 Black and 184 Black respectively on 1st November 1961 for use as target tugs. The navigator's station was reinstated but the armament and radar were not.

IL-28 – Czechoslovak engine testbed

A Czechoslovak Air Force IL-28 serialled 6915 (c/n 56915) was converted into an engine testbed by

the Walter engine company (now named Motorlet) in 1959. Originally it served to test the indigenous 890-kgp (1,960-lbst) Walter M-701 turbojet developed for the abovementioned L-29 Delfin. This centrifugal-flow turbojet was too portly to fit under the *Beagle*'s fuselage, so a rather unorthodox installation was chosen – the engine was installed in a 3-m (9 ft 10⅞ in) ogival fairing instead of the tail turret, breathing through a ventral 'elephant's ear' air intake which was mounted right over the aperture of the gunner's entry hatch. The bomb bay was occupied by test instrumentation.

The conversion was developed and performed by the design department of the aircraft's new operator, VZLÚ (*Výzkumní a zkušební letecký útvar* – Flight Test and Development Unit) at Prague-Letňany, the Czechoslovak equivalent of LII. Engineer Jiří Novák supervised the design effort.



IL-28 '6915' at Prague-Kbely in early guise with the M-701 development engine.

Here '6915' is seen in its latter days as a parachute testbed with VZS 031; the development engine is removed and its air intake and nozzle are blanked off.

The testbed made its first flight with the M-701 engine from Prague-Kbely AB on 28th November 1959. The crew comprised VZS 031 (*Vojenské zkušební středisko* – Military Test Establishment) test pilot Lt.-Col. Miroslav Dvořák, VZS 031 navigator Maj. Máj and VZLÚ test engineer Miroslav Kostroun. Later, the aircraft was also flown by pilots Capt. Habart and Lt. (SG) Jíša, navigator Capt. Dopita and test engineer Harant.

The testing was not altogether without incident – an in-flight fire of the development engine occurred on 31st December 1959 after a failed start-up attempt. Luckily the crew (the same one as on the first flight) managed to extinguish the fire, landing safely at Mladá AB. A new prototype engine was fitted and flights resumed on 7th April 1960.

In the meantime, the XL-29 prototype had made its maiden flight on 5th April 1959 with a Bristol Siddeley Viper Mk.20 turbojet rated at 1,361 kgp (3,000 lbst). Now the availability of the indigenous engine allowed the M-701 powered L-29 to make its 'second first flight' on 25th July 1960. Tests of the M-701 continued until October 1965, by which time the Delfin had been in production for two years.

In 1967 IL-28 '6915' was refitted for testing the 1,500-kgp (3,310-lbst) Ivchenko AI-25TL non-afterburning turbofan in a recontoured and more elongated fairing. This Soviet engine designed by OKB-478 under Aleksey G. Ivchenko powered the Aero L-39 Albatros advanced trainer, which again was supplied to the Soviet Union in large numbers. The Czechoslovak licence-built version was designated AI-25W (for Walter) and is sometimes referred to as the Walter Titan. The first flight in this new configuration with AI-25TL c/n 2 took place in June 1968, and the tests continued until 1970.

Another item tested on IL-28 '6915' was the French auxiliary power unit (APU) Microturbo Saphir, known for its use on the SEPECAT Jaguar strike aircraft. Aero intended to use this APU on the L-39, since the AI-25 turbofan has an air starter; thus, before purchasing a manufacturing licence the Czechs wanted to make sure that the Saphir met their requirements. In fact, Microturbo had make alterations to the design, producing a tailor-made version which then entered licence production as the Safir at a plant in Brno now known as PBS Velká Bíteš (PBS = *První Brněnská Strojírna* – First Brno Factory).

IL-28H engine testbed

The type did some development work in Poland as well. One IL-28 serialled '119 Blue' was transferred to the *Instytut Lotnictwa* (Institute of Aviation) in Warsaw and converted into an engine testbed designated IL-28H (*hamownia* – test rig or, in this case, testbed). It was used to test the indigenous 1,000-kgp (2,205-lbst) PZL-Rzeszów SO-1 axial-flow non-afterburning turbojet (*silnik odrzutowy* – jet engine) developed for the PZL TS-11 Iskra (Spark) advanced trainer.

The engine was installed on a special mount and was semi-recessed in the open bomb bay when on the ground. It was lowered clear of the fuselage by hydraulic rams before start-up; for ground runs the aircraft was parked over a special trench. The development engine's controls were installed in the navigator's station where

the test engineer sat. The test programme was successfully completed in the spring of 1964.

IL-28H as a UAV mother ship

Later the Instytut Lotnictwa used the IL-28H as a 'mother ship' for the indigenous Mak-30 supersonic UAV – a less than fully capable prototype version of the Hal-30 supersonic target drone intended for training fighter pilots and AD radar and SAM crews. Development of such UAVs began at the institute's experimental design manufacturing facility (ZKD – *Zakład Konstrukcji Doświadczalnych*) in 1959 under the direction of Jerzy Haraźny.

Flight tests began in 1960; three versions of the drone existed, and the first two were prototype vehicles. The original Mak-11 was ground-launched, following a ballistic trajectory because it had no autopilot. After a deal of redesigning it evolved into the Mak-30 – the first air-launched version, which had the definitive aerodynamic layout.

The Mak-30 was a two-stage vehicle utilising a tail-first layout. The cigar-shaped body was long and slender, featuring an ogival nosecone tipped with a pitot; stage 1 making up the rear 25% or so of the body length was a solid-propellant rocket booster and carried sharply swept cruciform stabilisers disposed at 45° to the vertical. Stage 2 had constant-chord wings positioned at two-thirds of the body length; these were swept back 45°, with zero dihedral and a planform similar to those of the English Electric Lightning interceptor (the trailing edge was at 90° to the fuselage axis along most of the span). Small all-movable canards of delta planform were mounted halfway between the wings and the nosecone. Two cylinders with the same maximum diameter as the body were mounted amidships on short pylons above and below the body, carrying small swept fins at the rear ends; these were to house a pair of ramjet sustainers, although the Mak-30 had only a dummy version, being solely rocket-powered. The UAV was equipped with a programmable autopilot, an autostabilisation system, data recorders and a 32-channel telemetry system. The Mak-30 had an overall length of 7.912 m (25 ft 11½ in), including 6.275 m (20 ft 7¾ in) for stage 2, a body diameter of 0.3 m (11¹³⁄₁₆ in), a stage 1 stabiliser span of 2.005 m (6 ft 6¹⁵⁄₁₆ in) and a wing span of 1.6 m (5 ft 3 in).

The IL-28H was fitted with a special pylon under the port wing root for carrying the Mak-30 aloft. During the first phase of the testing only stage 2 was carried in order to verify the autostabilisation system at subsonic speeds. After being released at 3,000 m (9,840 ft) and 500 km/h (310 mph) the UAV glided for about 40 seconds before the canards pitched it up to a high angle of attack at 1,100 m (3,610 ft), initiating a climb. When the UAV reached an altitude of 2,400 m (7,870 ft) the TSH-1 ribbon-type brake parachute (*taśmowy spadochron hamujący*) opened at 250 km/h (155 mph); the S-2 recovery parachute followed at an altitude of 400 m (1,310 ft) and the vehicle landed 8.5-9.5 km (5.28-5.9 miles) from the launch point.

The fully equipped Mak-30 was tested next, the launch occurring at 10,000 m (32,810 ft); the booster was ignited five seconds after release. The autopilot came into play after booster burnout and separation, maintaining level flight; as the speed decayed the UAV started descending. The brake parachute was deployed at 7,000 m (22,965 ft) and the recovery parachute followed suit at 2,000 m (6,560 ft), reducing the vertical speed to 12 m/sec (2,360 ft/min). The IL-28H flew a total of six sorties involving launches of the Mak-30 UAV.

The definitive version – the Hal-30 target drone – was dimensionally and structurally identical to the Mak-30, differing mainly in having functional ramjet sustainers rated at 130 kgp (286 lbst) each and fuel tanks for these. It was heavier than the Mak-30, having a launch weight of 500 kg (1,102 lb), including 360 kg (793 lb) for stage 2. The envisaged flight profile was as follows. The drone was to be launched at 10,000 m and the booster would accelerate it to 700 km/h (435 mph). By the time stage 1 burned out six seconds after ignition and was jettisoned, the ramjets would be running (operating time was 60 seconds) and the Hal-30 would accelerate to Mach 1.3-1.5; cruise altitude was 9,000 m (29,530 ft). If the drone was lucky enough to escape destruction, the brake parachute was to be deployed after sustainer shutdown, decelerating the drone, whereupon the recovery parachute would open.

Because of development problems the programme was terminated in late 1964 before the Hal-30 had a chance to be tested. A fully equipped example of the Mak-30 has been preserved at the Aerospace Museum in Kraków.

6. Parachute testbeds

IL-28 – Czechoslovak parachute testbed

Upon completion of the AI-25TL engine's tests the abovementioned IL-28 '6915' was transferred from VZLÚ to VZS 031, which used it for testing new models of parachutes by dropping dummies filled with sand. Hence the aft-mounted development engine and associated equipment were removed; the ventral air intake was deleted but for some obscure reason the long fairing was retained, though the nozzle was faired over. In this configuration the aircraft flew until struck off charge and scrapped in 1972.

IL-28 – Polish parachute testbeds

Two Polish Air Force IL-28s, 001 Red and 2 Red, were reportedly used by the Air Force's Technical Institute (ITWL – *Instytut Techniczny Wojsk Lotniczych*) in Warsaw to test the PB-28 brake parachute.

The H-5 final assembly shop at the Harbin Aircraft Factory.

IL-28 de-icing system testbed

In 1953 a Soviet Air Force IL-28 was used for testing a de-icing system that found use on the Antonov An-12 transport and the IL-18 airliner.

IL-28 heavy interceptor (project)

In 1951 the aforementioned KB-1 responsible for the S-25 air defence system protecting Moscow against a possible US nuclear air strike came up with the idea of a heavy interceptor version of the IL-28. This aircraft would be part of the S-25 system and was to be armed with G-300 air-to-air missiles. Since a single nuclear bomb would be enough to wreak untold havoc, the interceptors were to be the last line of defence, destroying any hostile aircraft that managed to slip through two SAM cordons around Moscow before they came close enough to drop the bomb.

The modified nose glazing of an H-5.

The G prefix did not mean anything specific – the components of the S-25 system were assigned letters in Russian alphabetical order (A-100 air defence radar, B-200 ground-based missile guidance radar, V-300 SAM, G-something-or-other for AAMs and their missile platforms, D-500 airborne missile guidance radar, Ye-600 warhead). Judging by the above sequence, the missile should have been designated G-400!

The G-300 missile was designed by the Lavochkin OKB as a scaled-down version of the V-300 (*izdeliye* 205), retaining the tail-first aerodynamic layout but having a length of 8.3 m (27 ft 2$^{49}/_{64}$ in) instead of 11.3 m (37 ft 0$^{7}/_{8}$ in) and a body diameter of 530 mm (1 ft 8$^{55}/_{64}$ in) instead of 650 mm (2 ft 1$^{19}/_{32}$ in). Like the larger version, the G-300 had a liquid-propellant rocket motor running on triethylamine xylidine and nitric acid. Originally it was to have semi-active radar homing, but then KB-1 opted for beam-riding missiles. The first version of the AAM had the in-house product code *izdeliye* 210.

Soon, however, KB-1 rejected the IL-28 because it lacked the space for the D-500 *Tai**foon*** (Typhoon) radar suite and could only carry two G-300 missiles. Worst of all, it was handicapped by insufficient endurance and would be unable to loiter for an extended time. The only option was the Tu-4 which, though admittedly inferior in speed, service ceiling and rate of climb, had the required payload and space, plus an on-station loiter time of four to five hours. A single Tu-4 was extensively modified as the G-310, easily qualifying as The Absolutely Heaviest Interceptor in The World. Armed with four AAMs in the *izdeliye* 211 version, it underwent initial flight tests In May-June 1952. However, various complications arose, and eventually the airborne part of the S-25 system was cancelled in 1953.

IL-28 as a reconnaissance UAV (project)

In 1956 the Soviet government tasked the Ilyushin OKB with converting the IL-28M remote-controlled target drone into a reconnaissance UAV by outfitting it with appropriate mission equipment, The aircraft was to perform reconnaissance over the forward edge of the battle area (FEBA) and beyond enemy lines in areas that were too dangerous for using regular IL-28Rs or other reconnaissance aircraft without the risk of losing the crews. However, the UAV remained a paper project because the assignment was cancelled in 1958.

Foreign production
Harbin H-5 (B-5) tactical bomber

In the early 1950s the Soviet Union supplied a number of IL-28 bombers and IL-28T torpedo bombers to the People's Liberation Army Air Force (PLAAF) and the People's Liberation Army Naval Air Force (PLANAF) of Communist China. The aircraft became China's first modern bomber and a valuable asset. A repair facility for the type was set up in Harbin but no manufacturing licence for the type was obtained. Hence after the rift in Sino-Soviet relations over ideological differences in the mid-1960s, which put an end to new aircraft deliveries from the USSR, China decided to build the IL-28 – without the benefit of a licence.

Logically enough, production of the IL-28, which received the local designation H-5 (*hongzhaji* – bomber), was assigned to the Harbin aircraft factory. Due to the exigencies of the notorious 'Cultural Revolution' policy, which had a drastic negative effect on the Chinese society in general and the aircraft industry in particular, the preparations to build the H-5 did not begin until 1963. In 1964 the factory started manufacturing spare parts for the Soviet-built IL-28s operated by the Chinese air arm; this logically led to the production of complete aircraft.

In fairness, the Chinese did not adopt a simple copycat approach and altered the design considerably, changing 40% of the structure and systems. In particular, the wings and tail surfaces lacked the IL-28's manufacturing break along the chord line – the Chinese dispensed with this manufacturing break and used a conventional wing design on the H-5. This gave a weight saving of some 110 kg (242 lb), albeit at the expense of a more difficult manufacturing process.

Changes were made to the defensive armament – the starboard forward-firing cannon was deleted and the IL-K6 spherical tail turret with two NR-23 cannons was replaced by a Chinese copy of the DK-7 turret (*distantsi**on**no oopravl**ya**yemaya kormo**va**ya oosta-**nov**ka* – remote-controlled tail cannon installation). The latter was borrowed from the Tu-16 (built in China as the Xian H-6) for the sake of commonality; this necessitated some changes to the rear fuselage structure. The new turret was of basically cylindrical shape and mounted

Above: The instructor's cockpit of an HJ-5 trainer.

Another view of the modified nose glazing looking remarkably similar to that of the experimental IL-28T on pages 68-69.

The gunner's station of an H-5 showing the very different tail turret.

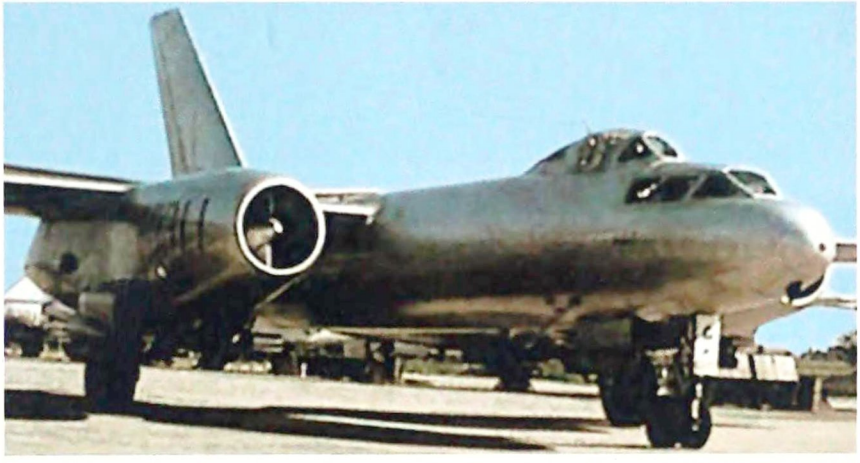
13002

83002

two Afanas'yev/Makarov AM-23 cannons; the AM-23 had the same 23-mm calibre but a much higher rate of fire (1,300 rounds per minute versus 850 rpm) and the ammunition supply was more than doubled – from 225 to 500 rpg. Additionally, the Chinese version had a different bomb-aiming radar with greater operational range, a different bomb sight with a wider field of view, and a different IFF system.

The different tail turret was the main external identification feature of the H-5. Also, a taxi light was added to the forward door of the nosewheel well. Another difference from the IL-28 was the twin-canopy brake parachute system.

Manufacturing of jigs and tooling started in 1964. The first two airframes – the flying prototype and a static test airframe – were completed in 1966 and the H-5 prototype took to the air on 25th September that year, flown by pilot Wang Wenying, navigator Zhang



Opposite page: The H-5's target-towing version without external stores. It seems that both photos depict the same aircraft (PLANAF '83002 Red'), the serial '13002 Red' having been retouched!

Above right: A PLANAF H-5 target tug with two targets and their winches under the wings.

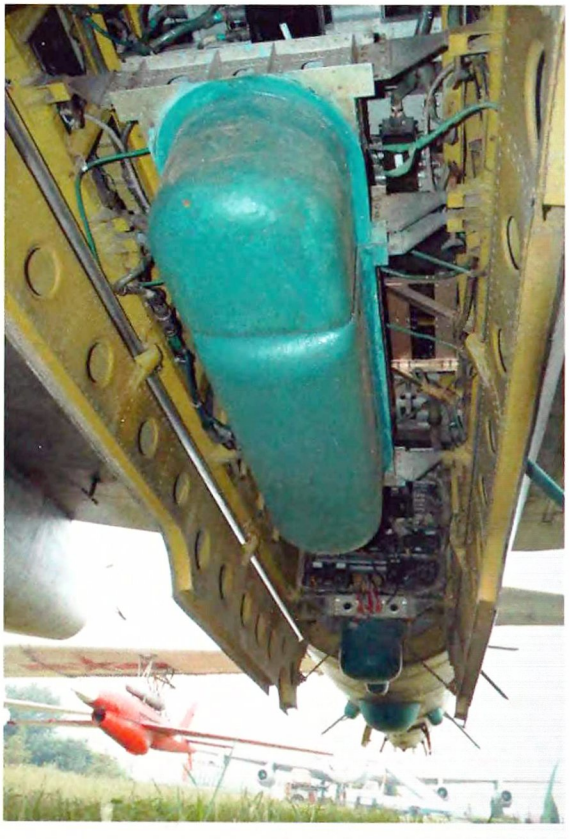
Right: An HJ-5 trainer of the PLANAF.

Below: An operational PLAAF HD-5 ECM aircraft.

Above: HD-5 '21112 Yellow' preserved in the PLAAF Museum shows off its many aerials.

Left and below left: Close-up of the blade aerials on the HD-5's forward and centre fuselage.

Below: The large direlectric canoe fairing in the HD-5's bomb bay houses emitter antennas. Note the cutouts in the bomb bay doors to fit around the fairing.



Huichang and GRO Zeng Fannan. Full-scale production at Harbin commenced in April 1967. The VK-1 engine for the bomber was likewise copied and produced by the Shenyang Engine Factory (SEF) as the WP-5A (*wopen* – turbojet engine).

Chinese-built *Beagles* were exported to Albania and Romania; the export version was designated B-5 (for bomber). The last of the Romanian examples remained active past 2000.

The H-5 had two construction number systems. **System 1** was straightforward, using seven characters. Thus, c/n H5-02706 is deciphered as follows: H-5, Batch 027, 06th aircraft in the batch; there could be 40 or more aircraft per batch. The c/n was normally stencilled under the starboard stabiliser.

System 2 has so far been seen on export aircraft (B-5s) only, featuring a nine-digit format. For example,

Top and above: The blade aerials on the HD-5's rear fuselage. The ventral clamshell doors are for the brake parachute housing.

Above left: The smaller rear dielectric 'thimble' in the bomb bay.

Left and far left: Two views of the mission equipment inside the bomb bay and the antenna blisters aft of the bay.

Top: The H-5 Ying avionics/weapons testbed, '83130 Red', in the white-bellied colour scheme.

c/n 511710307 means B-5, Batch 03, 07th aircraft in the batch; similarly, c/n 573190704 means B-5, Batch 07, 04th aircraft in the batch. The recurring groups of digits 1171 and 7319 may be codes for the Harbin aircraft factory which changed over time for security reasons.

H-5 nuclear-capable version (H-5A?)

A tactical nuclear strike version similar to the IL-28N was developed in September 1967 for both test and operational applications. No confirmed designation is known, although some sources call it H-5A.

The development effort was led by Xia Zhenhua. The first test drop of a nuclear bomb from such an aircraft at the Lop Nor Nuclear Test Range took place on 27th December 1968.

H-5 torpedo-bomber

A torpedo-bomber version equivalent to the Soviet Navy's IL-28T was developed for the PLANAF. It was armed with two Yu-2 rocket-powered torpedoes (a Chinese reverse-engineered version of the RAT-52) for attacking surface ships. No separate designation is known.

Harbin HJ-5 (BT-5) bomber trainer

A Chinese analogue of the IL-28U designated HJ-5 (*hongzhaji jiaolianji* – bomber trainer) was also

Above: The H-5 Ying takes off on a test flight with two YJ-8 missiles under the wings, showing off a yellow belly and yellow wing underside.

Another view of the same aircraft with Chinese test pilots posing alongside.

produced in Harbin. The prototype made its first flight on 12th December 1970; the HJ-5 was officially phased in by the PLAAF in 1972 and a total of 187 were built. Several examples were exported (notably to Romania) as the BT-5 (bomber trainer).

The trainer had a separate c/n system. For example, c/n 5101407 – i.e., BT-5, 10 may be a product code, Batch 14, 07th aircraft in the batch.

Harbin HZ-5 (B-5R) tactical reconnaissance aircraft

The Chinese also developed a photo reconnaissance version of the H-5 equivalent to the IL-28R. Brought out in 1970, it bore the designation HZ-5 (*hongzhaji zhenchaji* – bomber/reconnaissance aircraft) for the 'home market' or B-5R for export. The aircraft was equipped with two cameras for day/night high-altitude photography. Unlike the Soviet reconnaissance version, the HZ-5 had underwing drop tanks instead of tip tanks; these extended range by 47%, the combat radius by 50% and endurance by 1 hour 23 minutes.

Development of the PHOTINT version was rather protracted and the aircraft was not officially included into the PLAAF inventory until 1977.

Harbin HD-5 ECM aircraft

In the 1980s a small number of H-5s were converted to an ECM version roughly equivalent to the IL-28PP and designated HD-5 (*hongzhaji dian* – bomber/electronic warfare). The bomb bay housed a powerful jammer suite; the armament was deleted, the tail turret being replaced by a hemispherical dielectric fairing, and the crew included an electronic warfare officer (EWO) instead of a GRO. The fuselage sides ahead and aft of the wings bristled with blade aerials. A shallow dielectric canoe fairing and a dielectric thimble fairing were located in the bomb bay, the bay doors featuring cut-outs to fit around them when closed; a large teardrop-shaped dielectric blister was located on the centreline aft of the bomb bay, with three smaller dielectric blisters near it (one ahead of it on the centreline and two low on the rear fuselage sides aft of it).

The HD-5 usually operated in flights of three to cover a wide range of frequencies. The type remained in service at least until 1997; later it was replaced by an ECM version of the Shaanxi Y-8 four-turboprop medium transport – a Chinese derivative of the An-12.

H-5 target tug version

The Chinese developed a target-towing version that was quite unlike the Soviet, German, Polish, Finnish and Romanian ones. It carried two towed targets instead of one. Two forward-swept pylons were installed under the outer wings, each carrying a winch driven by a ram-air turbine in a tubular body; a rather small target resembling a missile with three fins was suspended underneath. No separate designation is known. The target tugs saw service with the PLANAF, so they were probably converted by the Navy's repair plant No.4724.

H-5 Ying avionics/weapons testbed

In the early 1980s the Chinese aircraft industry began development of the Xian JH-7 (*jianjiji hongzhaji* – fighter-bomber, NATO reporting name *Flounder*), aka FBC-1 Flying Leopard (FBC = Fighter-Bomber, China). This two-seat supersonic machine powered by two afterburning turbofans, which first flew on 14th December 1988, was envisaged as a successor to both the H-5 and the smaller Nanchang Q-5 *Fantan* fighter-bomber. The type achieved initial operational capability with the PLANAF in 1990.

As part of the JH-7 programme, the No.603 Research Institute converted a PLANAF H-5 serialled '83130 Red' into a combined avionics/weapons testbed known as H-5 Ying ('Eagle' in Chinese). The actual conversion work was done by the Navy's repair plant No.4724. The navigator's station was transformed into an avionics bay housing the radar set of the JH-7's Type 232H Eagle Eye multi-function pulse-Doppler fire control radar, the testbed's name being clearly derived from the radar's name. A large ogival radome tipped with a pitot supplanted the nose glazing; it was slightly angled downwards (presumably at the same angle as on the actual JH-7), and a small air scoop was provided high on the port side aft of the radome for cooling the radar set.

Two pylons identical to those of the target-towing version were installed under the outer wings, enabling the carriage of two YJ-8 anti-shipping missiles (YJ = *Ying Ji* – 'Eagle Strike', the generic prefix for Chinese ASM designations) for the purpose of their integration with the radar. Developed by the China Haiying Electro-mechanical Technology Academy (CHETA; *haiying* is Chinese for 'sea eagle'), this 625-kg (1,377-lb) missile, also designated C-801, is the JH-7's primary weapon.

The H-5 Ying wore two different colour schemes during its test career. Originally the aircraft was white overall, with a red rudder and a narrow red stripe (underlined by a blue pinstripe) running the full length of the fuselage; later the entire belly below the red stripe and the wing underside were painted yellow.

HJ-5 ejection seat testbed

A single HJ-5 trainer is known to have been modified for ejection seat trials. Thus it was the Chinese counterpart of LII's IL-28U-LL ('501 Blue') described above.

H-5B (?) engine testbed

As early as the end of 1962 the issue arose of replacing the IL-28's VK-1 turbojets with more powerful and fuel-efficient engines. The Shenyang Aero-Engine Research Institute (SARI) and the Chinese Aeronautical Establishment (CAE) teamed up to begin development

Specifications of the Harbin H-5		
	H-5	**HJ-5**
Length overall	16.768 m (55 ft 0⅝ in)	17.472 m (57 ft 3⅛ in)
Height on ground	6.2 m (20 ft 4⅜ in)	6.2 m (20 ft 4⅜ in)
Wing span	21.45 m (70 ft 4³¼ in)	21.45 m (70 ft 4³¼ in)
Wing area, m² (sq. ft)	60.8 (653.76)	60.8 (653.76)
Normal all-up weight, kg (lb)	18,400 (40,570)	n.a.
Maximum all-up weight, kg (lb)	21,200 (46,740)	18,260 (40,260)
Bomb load, kg (lb):		none
normal	1,000 (2,204)	
maximum	3,000 (6,613)	
Top speed, km/h (mph)	902 (560)	902 (560)
Service ceiling, m (ft)	12,500 (41,010)	n.a.
Ferry range at 10,000 m (32,810 ft), km (miles)	2,400 (1,490)	2,394 (1,486)

of the WS-5 turbofan (*woshan* – turbofan engine). Based on the core of the proven WP-6 afterburning turbojet (a Chinese copy of the Mikulin RD-9B), it utilised the rarely used aft-fan layout and had adjustable stator vanes on the first three compressor stages instead of bleed valves as a means of preventing surge.

The design work was apparently completed as early as 1963 and the first prototype of the WS-5 commenced bench running in 1965. The tests were beset by troubles – the aft fan was not performing as it should and the turbine blades failed after a very short running time. The WS-5 had to be redesigned repeatedly, and it was only the seventh prototype engine that showed the desired results during bench tests.

It was planned to use a suitably modified H-5 bomber as a testbed for the WS-5, and the engine nacelles were redesigned to accept the turbofans. With a thrust of 3,570 kgp (7,870 lbst), the new engine was expected to give a dramatic boost in performance. A prototype was actually built and reportedly even began taxying tests, but in 1973 the Chinese government cancelled the programme without giving any reasons. Some sources attribute the designation H-5B to the re-engined aircraft.

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The importance of the IL-28 in the development of the Soviet Air Force can hardly be underestimated. To the Soviet Union and its allies it was what the English Electric Canberra was to the West, which gave rise to the nickname 'Soviet Canberra' – albeit much later, when the IL-28 was 'dead and buried'. The Canberra was clearly luckier than its Soviet counterpart, soldiering on well into the 1980s – mostly in the reconnaissance and target tug roles.

It may be mentioned the IL-28 had a sequel in the shape of the IL-46 medium bomber developed pursuant to a Council of Ministers directive dated 24th March 1951. It looked like a scaled-up IL-28 powered by two 5,000-kgp (11,020-lbst) Lyul'ka AL-5 axial-flow turbojets (also called TR-3A). The defensive armament consisted of four NR-23 cannons arranged in the same fashion as on the IL-28, but the IL-K8 tail turret was new, featuring a much bigger field of fire and an ammunition supply increased to 320 rpg. The landing gear design was also similar, except that the main units consisted of two independent shock struts side by side, the outboard struts retracting forward and the inboard ones aft, so that the wheels lay flat in tandem; this unusual arrangement made it possible to minimise the nacelle cross-section. The aircraft had a length of 25.325 m (83 ft 1 in), a wingspan of 29.0 m (95 ft 1⁴⁷⁄₆₄ in), a wing area of 105 m² (1,129 sq. ft), an empty operating weight of 26,300 kg (57,980 lb) and a normal take-off weight of 41,840 kg (92,240 lb). The normal bomb load was three times that of the IL-28 – 3,000 kg (6,610 lb), and the maximum bomb load was 6,000 kg (13,230 lb). Well, if the IL-28 was a *Beagle*, then the IL-46 was surely a Borzoi – a Russian wolfhound; or, more likely from a Cold War era Western standpoint, a Big Bad Wolf.

The ADP stage was completed on 4th December 1951 and the straight-wing first prototype was built at an amazingly fast pace, being rolled out on 29th December that year (!). On 3rd March 1952 the IL-46 made its first flight with Vladimir K. Kokkinaki at the controls. Manufacturer's flight tests gave promising results – the aircraft had a cruising speed of 700 km/h (435 mph), a top speed of 928 km/h (576 mph) at 5,000 m (16,400 ft) and a range of 4,845 km (3,009 miles). The state acceptance trials were completed on 15th October, showing that the bomber fully met the Air Force's operational requirement.

The second prototype designated IL-46S was rather different, representing the envisaged production version. It was to have wings swept back 35° (hence the S for *strelo**vid**noye kry**lo*** – swept wings) and moved forward along the fuselage, which would allow it to attain the 1,000-km/h (621-mph) speed target; it also allowed the bomb bay to be made longer. However, the IL-46S was never completed, losing out to the more promising and modern Tu-16.

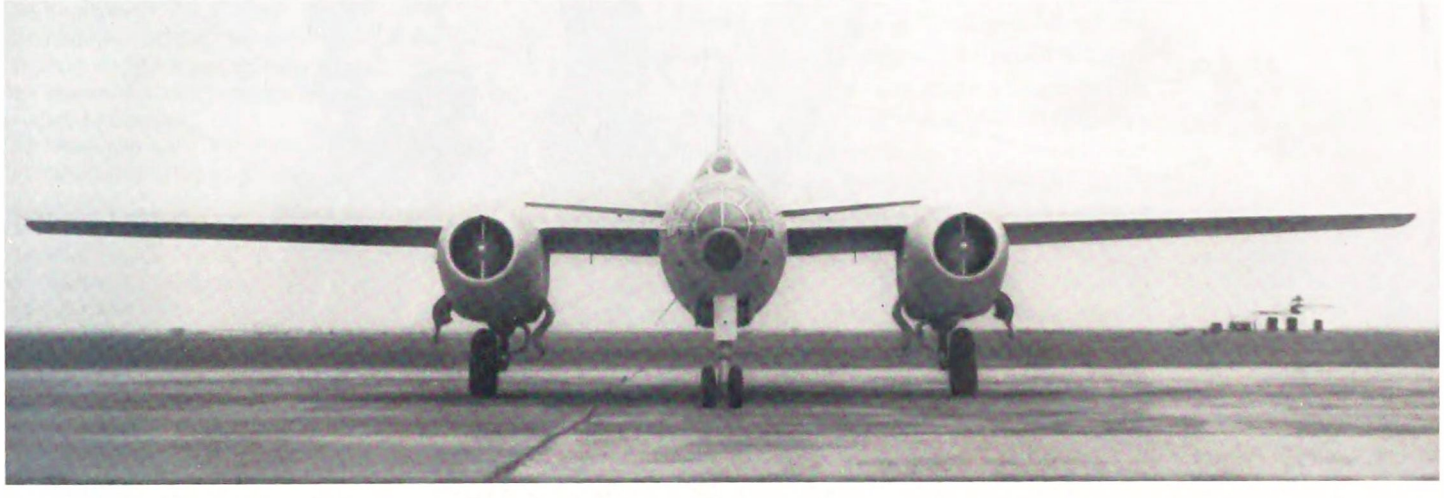
CHAPTER FIVE

The IL-28 in detail

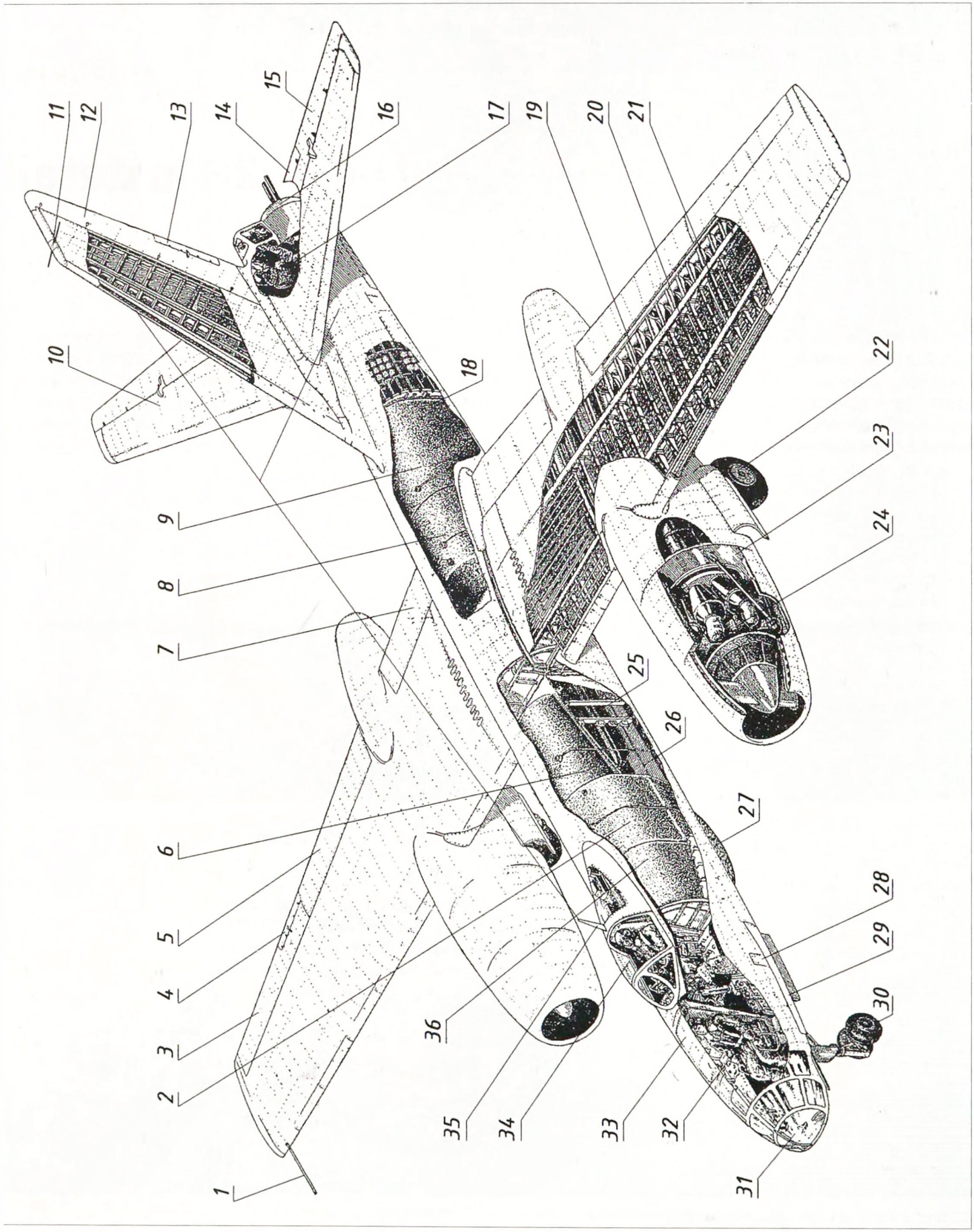
The following structural description applies to the basic IL-28 *sans suffixe*. Details of other versions are given as appropriate.

Type: Twin-engined tactical bomber designed for operation in daytime and night VMC and IMC. The aircraft has a crew of three: pilot, navigator/bomb aimer (who also acts as flight engineer) and GRO.

The airframe is of all-metal construction, with flush riveting used throughout. The primary structural materials are D16T and D16ATM duralumin, V95ATM and AMTs aluminium alloys; AK6 aluminium alloy (*alyu**min**iy **kov**ochnyy* – aluminium optimised for forging) is used for the wing/fuselage attachment fittings and grade 30KhGSA steel for the tail unit/fuselage attachment fittings. The glazing frames of the cockpit



'27 Blue', a standard IL-28 *sans suffixe* bomber.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Cutaway drawing key:

1. Main pitot
2. No.2 fuel tank
3. Starboard aileron
4. Aileron trim tab (starboard side only)
5. Outboard flap section
6. No.3 fuel tank
7. Inboard flap section
8. No.4 fuel tank
9. Oxygen bottles
10. Starboard stabiliser
11. Glideslope beacon receiver aerial
12. Rudder
13. Rudder trim tab
14. Port elevator trim tab
15. Port elevator
16. IL-K6 cannon barbette
17. Gunner/radio operator's station
18. No.5 fuel tank
19. Wing rear spar
20. Wing ribs
21. Wing front spar
22. Main gear unit
23. Landing light (retracted)
24. Klimov VK-1 (VK-1A) turbojet
25. Port forward KD-3 bomb cassette
26. Bomb bay
27. Radome for PSBN-M bomb-aiming radar
28. Port ammunition box access hatch
29. Removable access panels for port forward-firing NR-23 cannon
30. Nose gear unit
31. Navigator's station glazing
32. Navigator's ejection seat
33. Navigator's entrance hatch
34. Pilot's ejection seat
35. Radio/ADF aerial mast
36. No.1 fuel tank

canopy, navigator's station and gunner's station, as well as the frames of the navigator's and tail gunner's entrance hatches, are made of ML5-T4 magnesium alloy (***mag**niy li**tey**nyy* – magnesium optimised for casting; the T4 is a reference to the thermal treatment mode).

Fuselage: Circular-section semi-monocoque stressed-skin structure. The skin panels are supported by 52 stamped frames – Nos. 1-10, 11A, 11B, 12-17, 17A, 18, 18A, 18B and 19-47, including 14 mainframes – and 38 extruded stringers, including seven reinforced stringers; interestingly, frame 9 is followed by a former with the same number and no letter. (Some sources additionally mention frames 38A, 38B, 42A and 42B!) Skin thicknesses are 0.8; 1.0; 1.2; 1.5; 1.8; and 2.0 mm (0.031; 0.039; 0.047; 0.059; 0.070; and 0.078 in); maximum thickness is in the area of the bomb bay. The spacing of the fuselage frames varies from 128 to 550 mm (from ≈ 5¾₄ in to 1 ft 9²½ in). Maximum fuselage diameter in the section between frames 17 and 20 is 1.8 m (5 ft 10⁵⁵⁄₆₄ in); the maximum fuselage height, including the cockpit canopy, is 2.18 m (7 ft 1⁵¾₄ in). The fuselage is usually manufactured in four sections for ease of assembly.

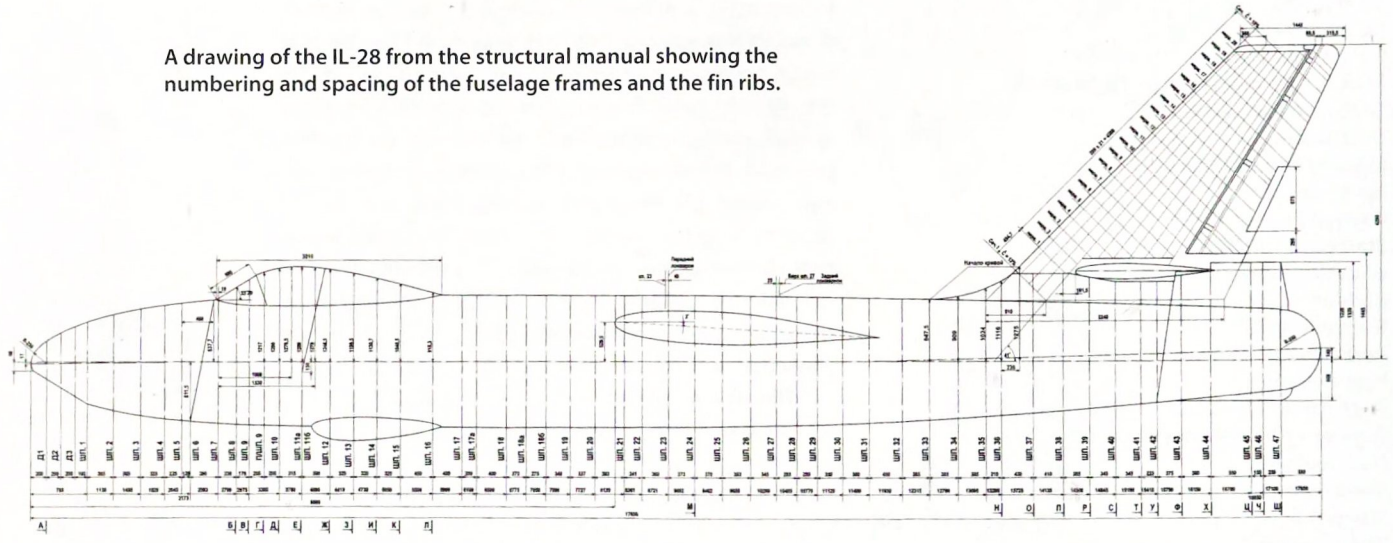
The *forward fuselage* (section F1, frames 0-11A) incorporates a pressurised navigator's station (frames 0-6) and a pressurised cockpit (frames 6-11A), both of which have sloping rear bulkheads with guide rails for the ejection seats. Pressurisation is ensured by placing special sealing tape between the skin and the internal structure before riveting. The navigator's station and the cockpit are lined with quilted heat- and sound-proofing mats made of ATIM-1 (*aviatsi**on**nyy **tep**lo'izolyatsi**on**nyy materi**ahl*** – aviation thermal insulation material) and ANZM (*aviatsi**on**nyy nevosplame**nya**yemyy **zvoo**ko'izolyatsi**on**nyy materi**ahl*** – aviation non-combustible soundproofing material).

The navigator's station features extensive glazing, which is asymmetrical, with three rows of glazing panels to port and four to starboard. The glazing panels are attached to the cast magnesium framework (frames D1-D2-D3-1-2) by duralumin strips and screws. The optically flat lower forward panel having an elliptical shape is made of Triplex silicate glass 13-15 mm (0³³⁄₆₄-0¹⁹⁄₃₂ in) thick; the rest of the glazing is moulded Plexiglas, each panel consisting of two 10-mm (0²⁵⁄₆₄ in) panes with a gap in between and a silica gel cartridge to absorb the moisture and prevent misting up. The dorsal entrance hatch (frames 3-6) is slightly offset to starboard and the jettisonable cover measuring 1.06 x 0.84 m (3 ft 5⁴⁷⁄₆₄ in x 2 ft 9⁵⁄₆₄ in) is hinged to port; the navigator's ejection seat is immediately below it. When working with the optical sight or radar, the navigator uses a tip-up 'jump seat' attached to frame 2, facing left.

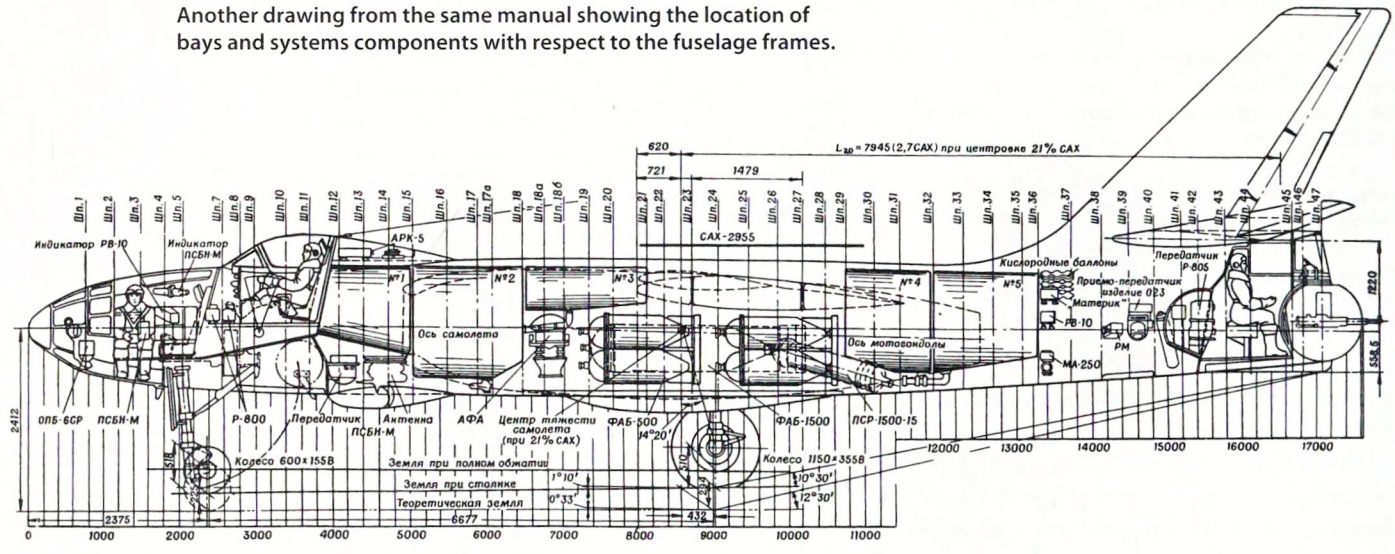
On the IL-28U trainer the navigator's station is replaced by the instructor's cockpit featuring a parabolic metal nosecone and a canopy which is flush with the fuselage top. Its frame numbering differs from that of the bomber: 0-A-B-V (in Cyrillic alphabetical order)-1-1A-2-3-4-5-6. The forward canopy consists of a windshield (featuring an optically flat birdproof Triplex windscreen of hexagonal shape and two flat trapezoidal sidelights, the port one incorporating an inward-opening circular direct vision window), two side windows on each side (the forward pair are diamond-shaped and the rear one is trapezoidal) and a cover with tandem transparencies hinged to starboard.

The cockpit (or, on the IL-28U, the trainee's cockpit) is enclosed by a teardrop canopy 3.01 m (9 ft 10½ in) long comprising a fixed windshield (frames 7-9), a mechanically jettisonable centre section hinged to starboard (frames 9-11A) and a metal rear fairing (frames 11A-16) incorporating a dielectric panel for the ADF set and loop aerial. The windshield features an optically flat birdproof Triplex windscreen inclined 33°30', which is 13-15 mm thick and has a cropped elliptical shape, and curved triangular sidelights. The latter and the one-piece blown transparency of the centre section are made of Plexiglas; originally they were composed of two layers with a gap in between, the

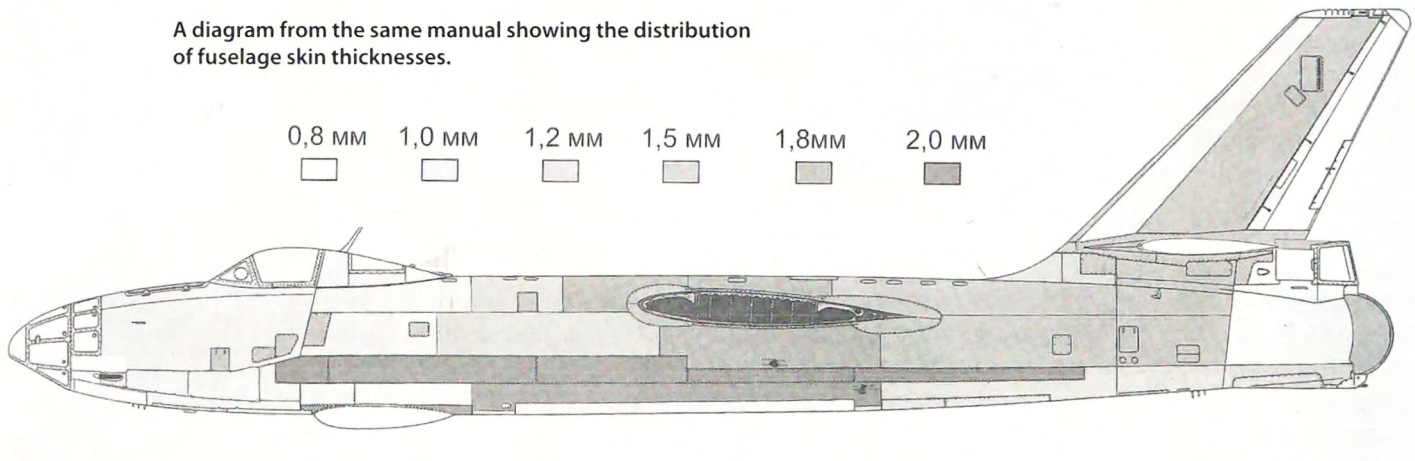
A drawing of the IL-28 from the structural manual showing the numbering and spacing of the fuselage frames and the fin ribs.

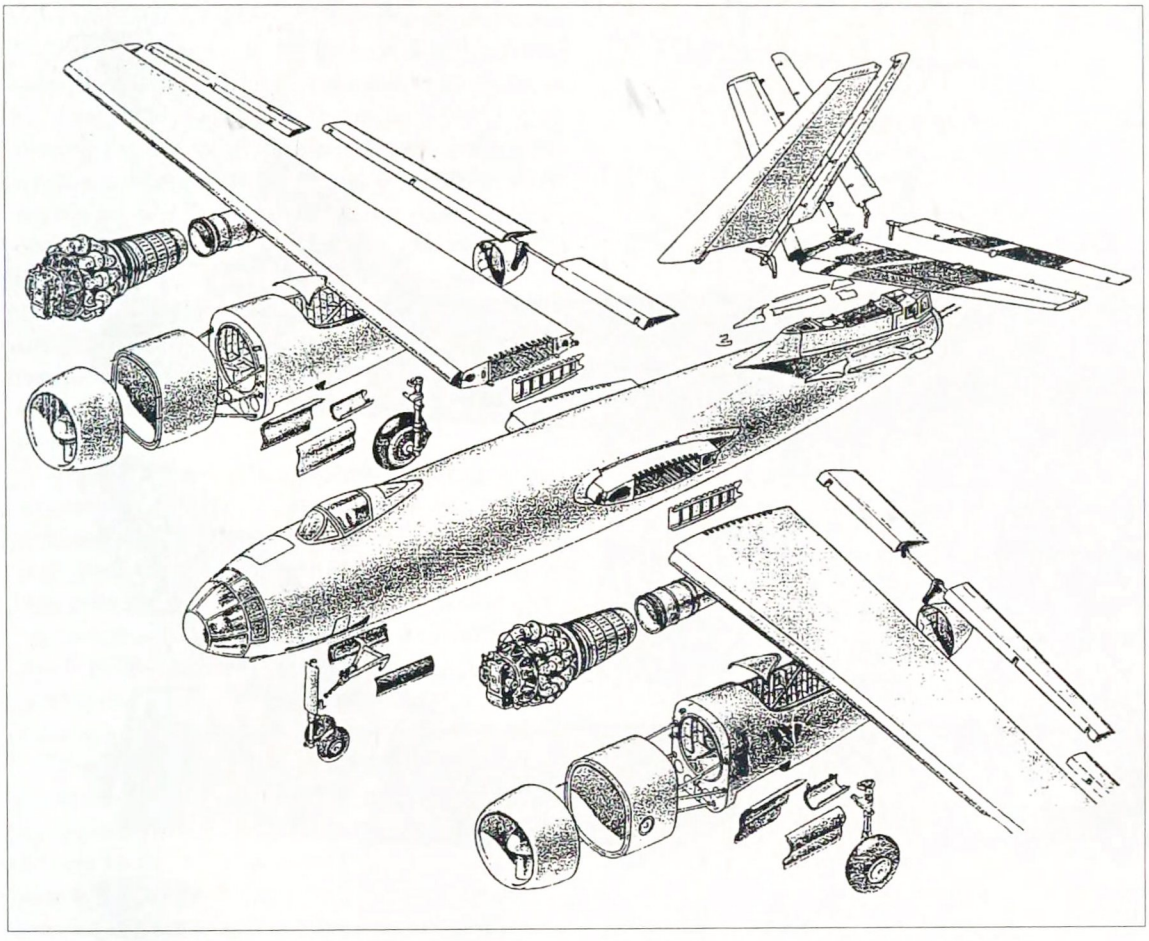


Another drawing from the same manual showing the location of bays and systems components with respect to the fuselage frames.

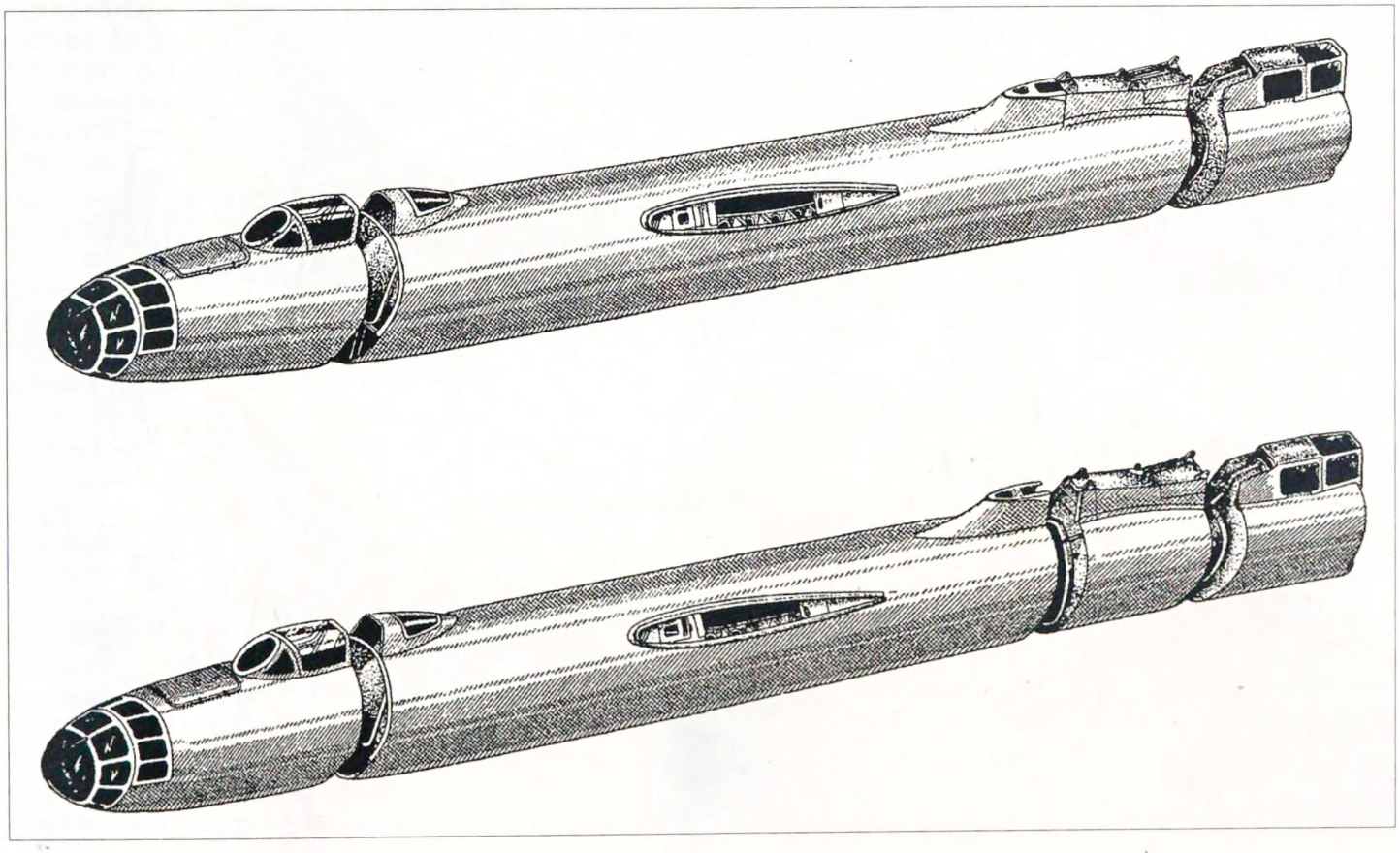


A diagram from the same manual showing the distribution of fuselage skin thicknesses.



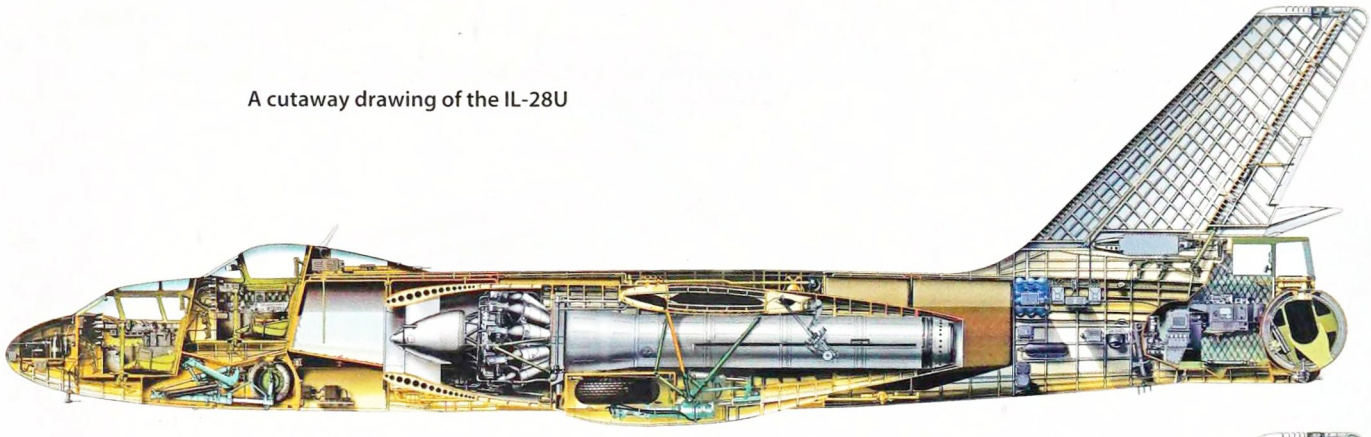


An exploded view of the IL-28. The fuselage is shown 'unexploded' for simplicity's sake.

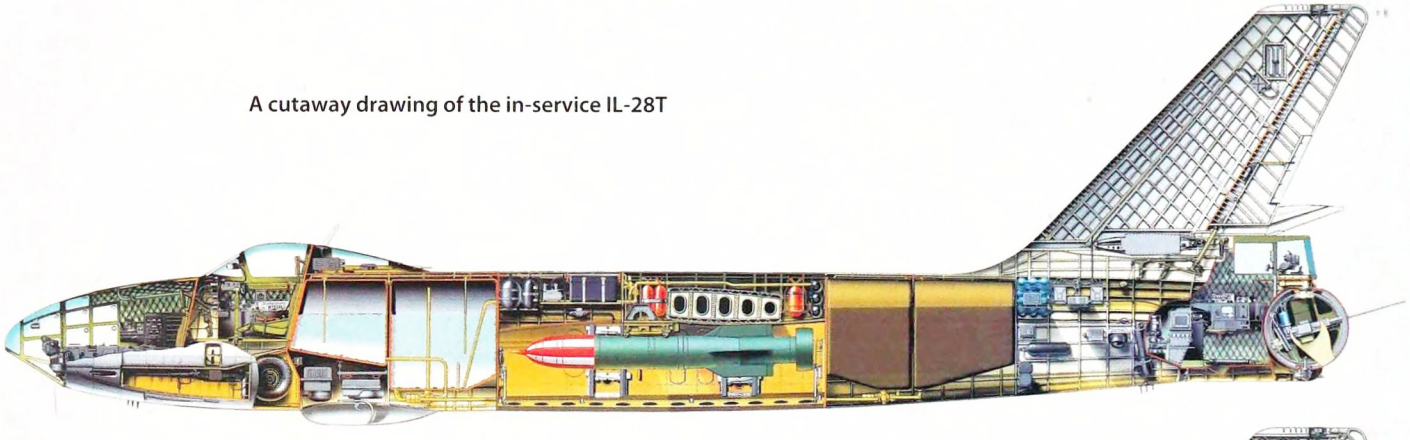


This drawing from the structural manual illustrates the difference between the fuselage design of Voronezh-built IL-28s (upper) and those built by the other plants (lower).

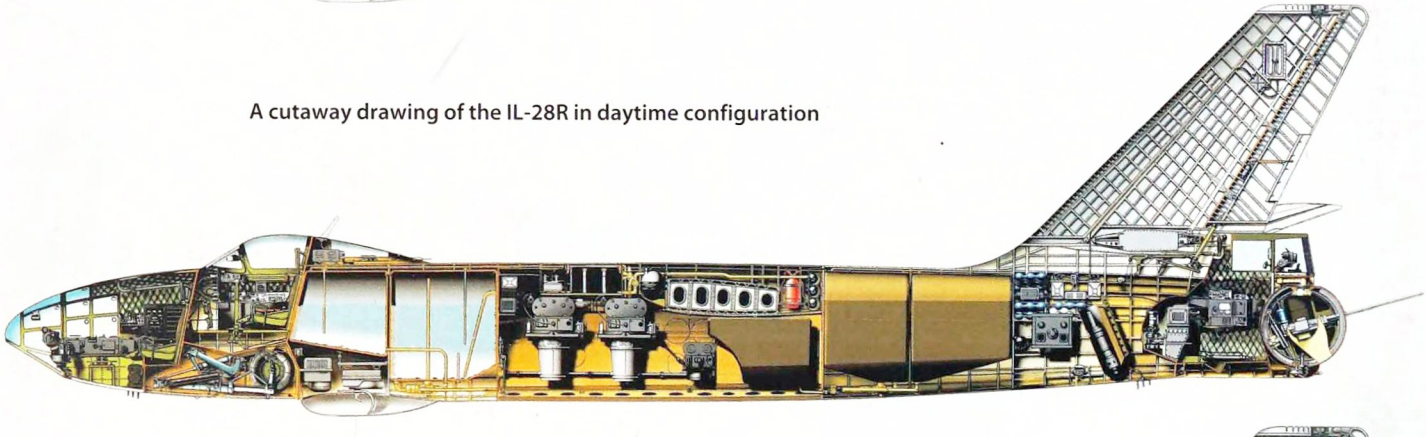
A cutaway drawing of the IL-28U



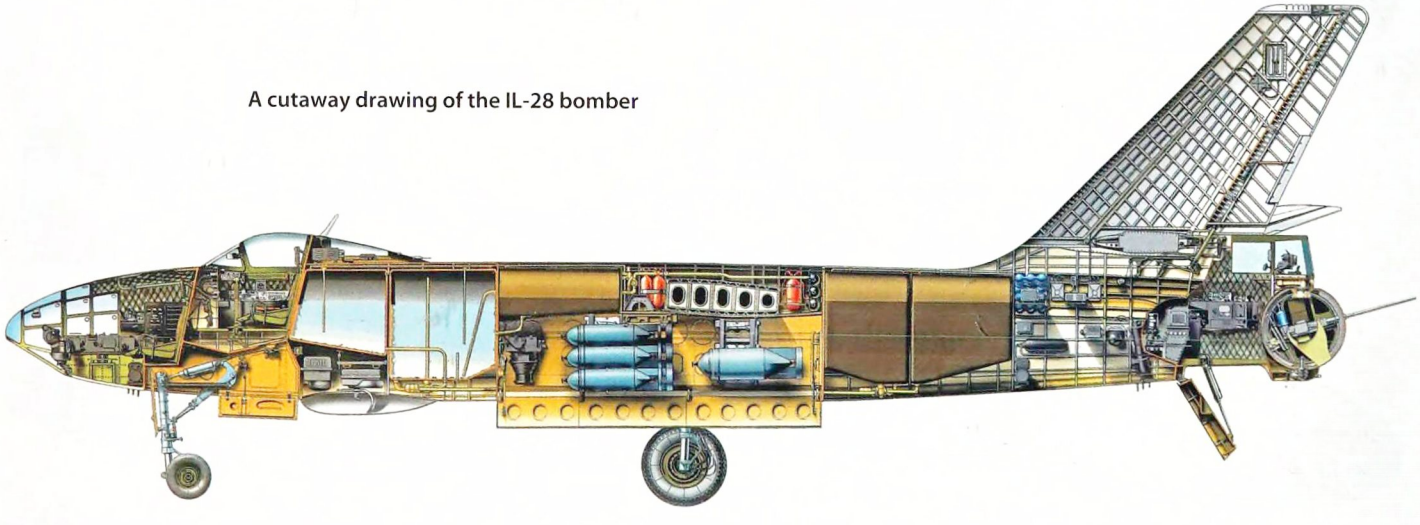
A cutaway drawing of the in-service IL-28T



A cutaway drawing of the IL-28R in daytime configuration



A cutaway drawing of the IL-28 bomber



outer and inner layers being 12 mm and 4 mm (0 15/32 and 0 5/32 in) thick respectively, and silica gel cartridges; these were later superseded by single-layer transparencies of 18-mm (0 45/64 in) Plexiglas. To prevent misting up on the ground, an inward-opening circular direct vision window was originally incorporated into the port side of the hinged canopy section; later it was relocated to the port sidelight. For blind flying training the canopy may be closed from the inside by a black satin hood.

The forward fuselage incorporates the nosewheel well (frames 4-11A) and lateral bays for one (to port) or two forward-firing cannons (frames 2-8). The cannon bays are closed by detachable panels held in place by screws.

The ejection seats have back plates of 10-mm steel armour and dished seat pans of 6-mm (0 15/64 in) steel; some sources quote the thickness of the metal on the seat pans as 10 mm. Additional duralumin armour sheets 10-30 mm (0 25/64-1 3/16 in) thick are installed under the navigator's seat and there's a 10-mm steel armour sheet aft of the pilot's seat. The navigator's station glazing and the cockpit windshield do not incorporate bulletproof glass.

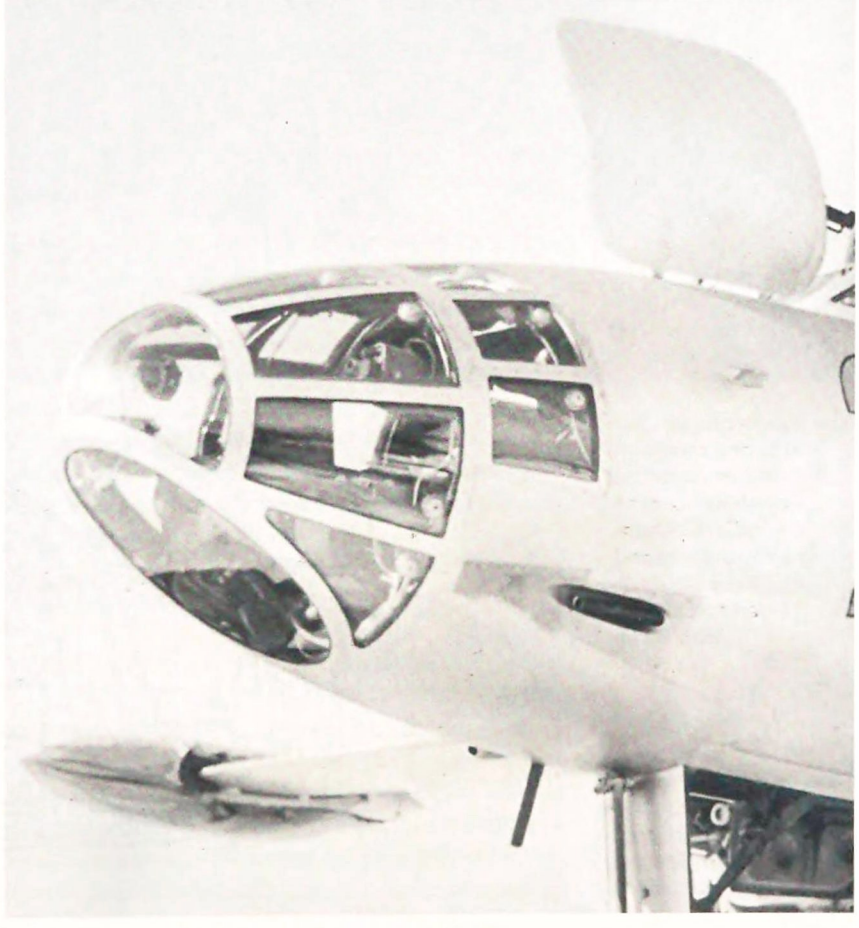
The *centre fuselage* (section F2, frames 11B-38) is unpressurised, incorporating the forward avionics bay for the search radar (frames 11B-15) and the bomb bay (frames 18-29). It also accommodates the wing centre section (frames 23-27) and the fuel tanks. The forward avionics bay has a ventral cutout for the search radar antenna which is covered by a detachable teardrop radome (frames 11A-16) made of foam polystyrene 15 mm (0 19/32 in) thick with a reinforced outer layer.

The bomb bay is 4.18 m (13 ft 8 3/16 in) long and 0.95 m (3 ft 1 13/32 in) wide, with an average depth of 1.1 m (3 ft 7 19/64 in). It is closed by pneumatically-actuated clamshell doors carried on four hinges, the starboard door incorporating emergency access hatches allowing the doors to be opened manually on the ground. The forward actuating mechanism connected to the transverse actuating ram at frame 18 is linked by synchronising cables and rollers on the starboard side of the bay to the rear actuating mechanism. On the IL-28R and IL-28T the front end of the bomb bay may feature a rescue dinghy stowage container with a dorsal cover.

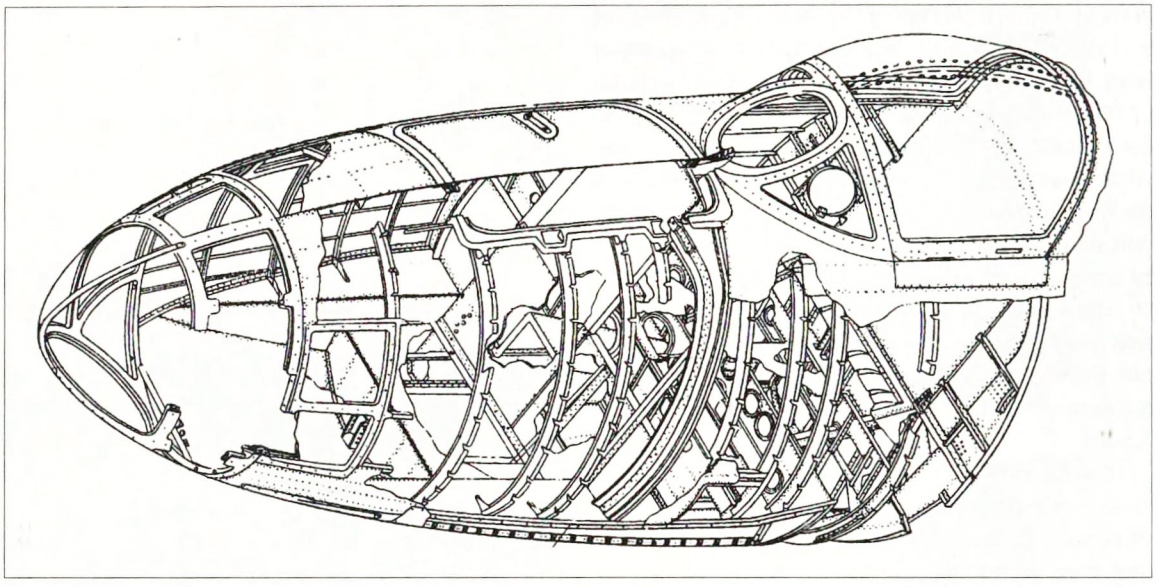
The *rear fuselage* (section F3, frames 38-42) is also unpressurised, featuring the rear avionics/equipment bay (frames 36-42, with a ventral access hatch opening to starboard between frames 38-40) and tail unit attachment fittings located at frames 38, 40 and 42. On late production aircraft the avionics/equipment bay access hatch cover carries a brake parachute housing and opens aft for access to the bay. IL-28s built by plant No.64 in Voronezh have sections F2 and F3 combined into a single whole, so that the fuselage is built in three sections with manufacturing breaks at frames 11 and 42. Channels closed by detachable access panels held in

The forward fuselage of an IL-28 bomber, showing the radome of the PSBN-M radar and the starboard nose cannon.

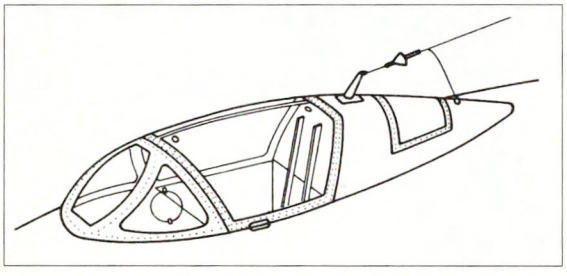
This view of an IL-28R with the navigator's entry hatch open shows the asymmetric nose glazing resulting from the instrument panel on the port sidewall. Note the gun blast plate.



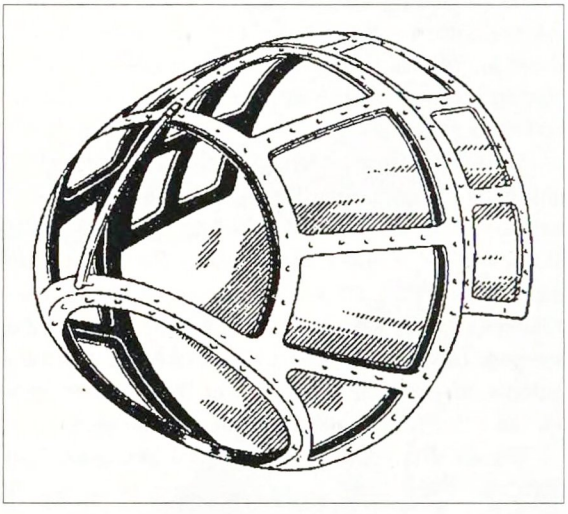
A drawing of the forward fuselage (section F1) from the structural manual.



Right: The cockpit canopy; note the ejection seat guide rails.



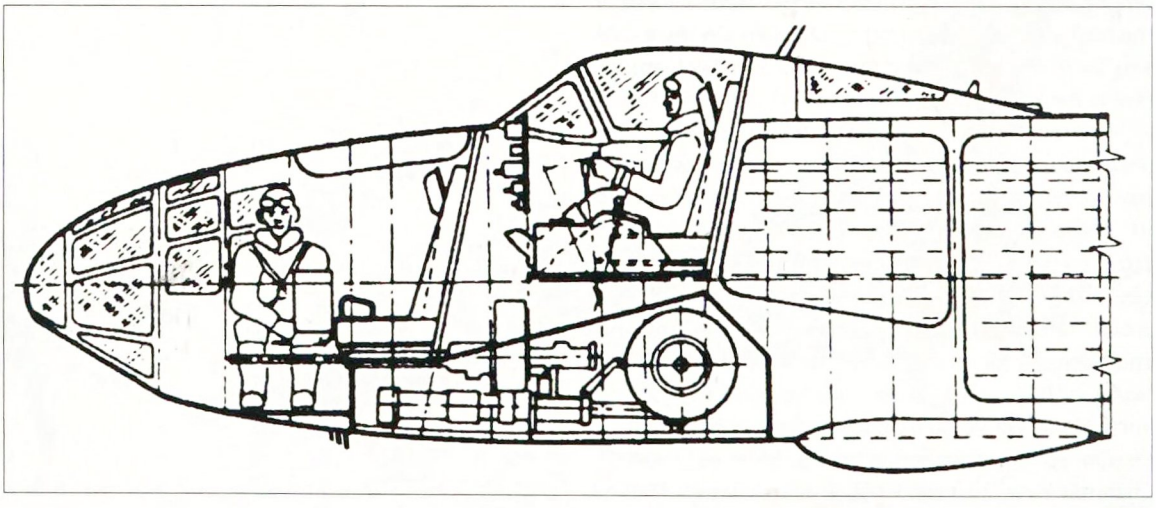
Far right: The navigator's station glazing frame, showing the strips holding the transparencies in place.

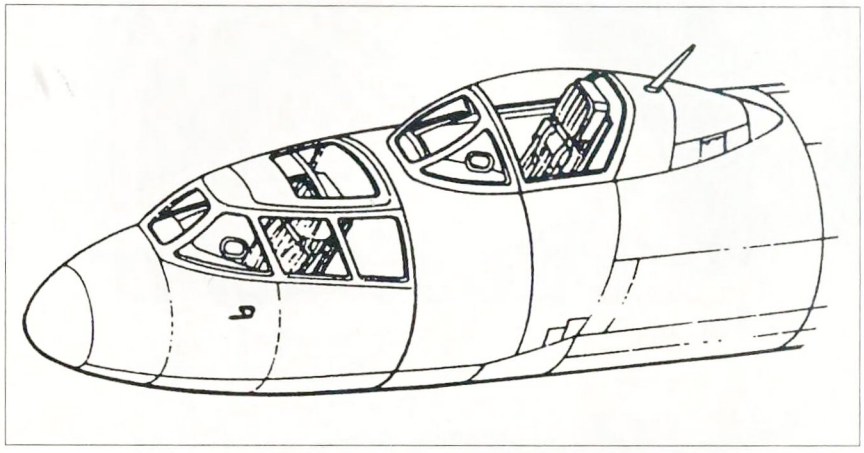


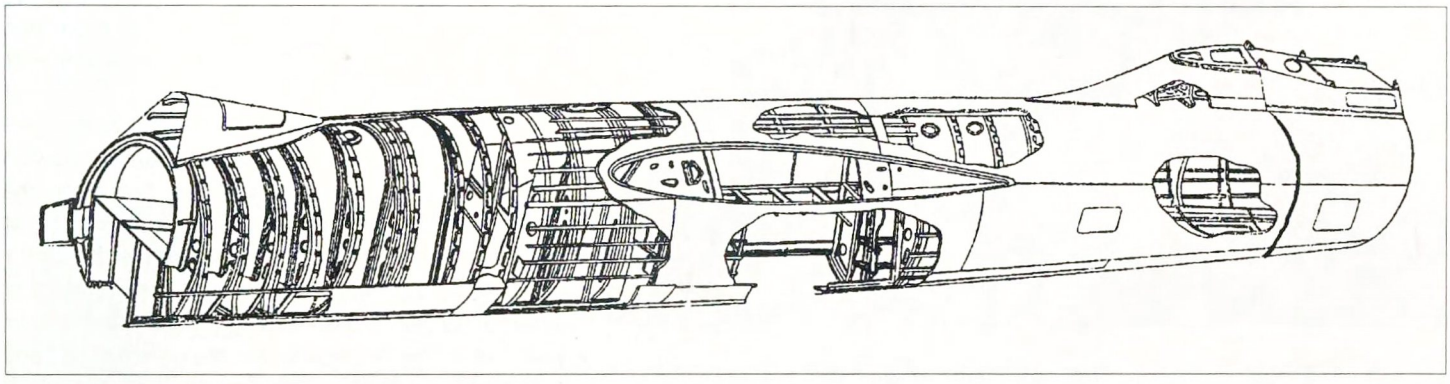
place by screws are located low on the centre/rear fuselage sides up to frame 36 to accommodate wiring bundles. A port for an oblique camera closed by horizontally split outward-opening clamshell doors is located on the port side (frames 39-40). Aircraft

The cockpit canopy. The rear fairing carries an aerial mast for the combined comms radio/ADF non-directional aerial and features a dielectric insert for the ADF loop aerial.

This drawing shows the navigator sitting sideways on his jump seat, as well as the nose cannon(s).

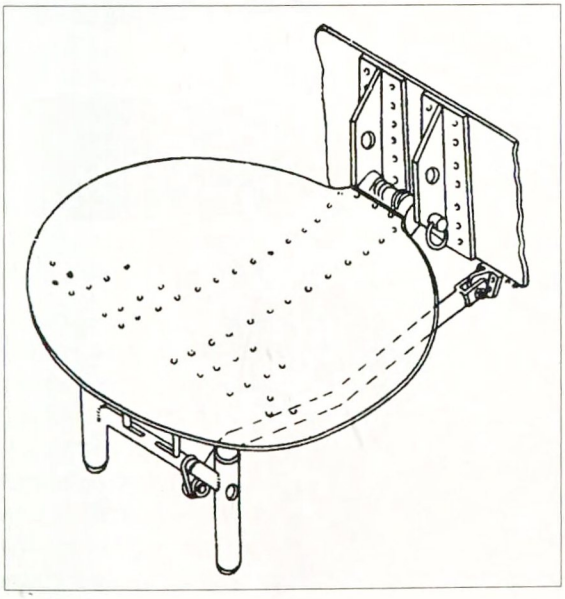






manufactured up to mid-1953 had two cassettes for PAR-8 parachute-retarded illumination flares (frames 40-41) with doors secured by electromagnetic locks.

The *tail section* (section F4, frames 42-47) is the pressurised gunner's station making use of the same structural sealing and insulation technologies; it is attached to the rear fuselage by 36 bolts. The cabin is accessed via a ventral hatch located between frames 42 (42B) and 45 whose cover opens forward through 75° under its own weight or by means of two pneumatic rams and has integral steps. The GRO sits on a round seat without a back that swings into position on a strut located on the port side. Frame 47 serves as a mounting for the tail turret; on the IL-28U and the IL-20 a hemispherical fairing with a radius of 550 mm (1 ft 9 21/32 in) replicating the shape of the turret is attached to this frame. The gunner's station has a 106-mm (4 1/64 in) bulletproof rear window, a trapezoidal upper window and 68-mm (2 43/64 in) bulletproof rear side windows (the foremost pair of side windows has Plexiglas glazing); additionally, the gunner and the ammunition boxes of the turret are protected by 8-mm (0 5/16 in) steel armour from the sides and an aluminium armour sheet from below. The total weight of the armour is 454 kg (1,000 lb). The port forward side window is a jettisonable escape hatch to be used in the event of ditching or a belly landing when the ventral hatch is unusable. On IL-28T torpedo-bombers the roof of the tail gunner's station incorporates a jettisonable escape hatch serving the same purpose.



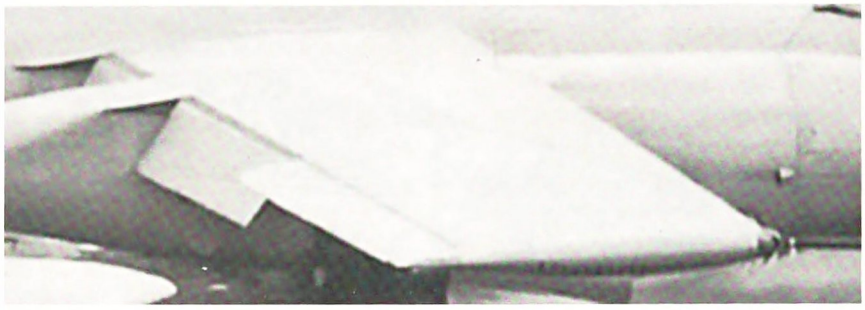
Wings: Cantilever shoulder-mounted wings of trapezoidal planform, with no leading-edge sweep and slight forward sweep on the trailing edge. The wings are of two-spar stressed-skin construction and are built in three sections; the centre section is integrated into the fuselage and the detachable outer wings are one-piece structures carrying the engine nacelles. Dihedral 0° on the centre section and 0°38' on the outer wings,

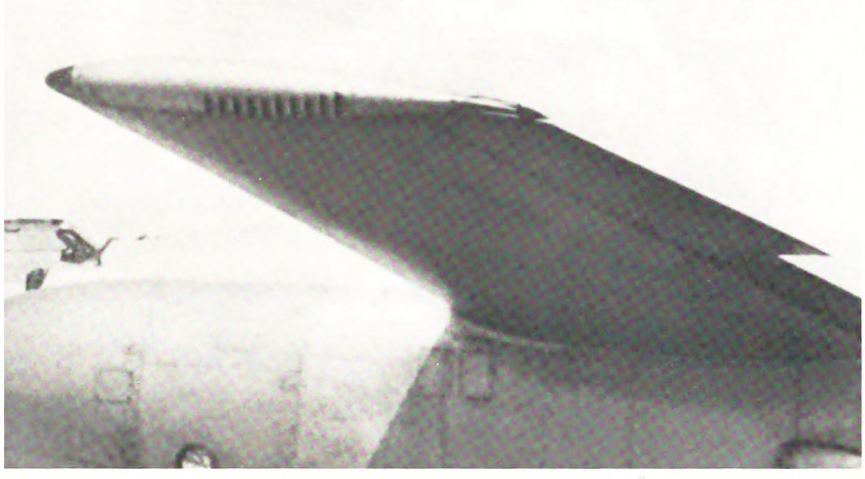
Top left: Front view of an IL-28U's cockpits showing the curious hexagonal shape of the instructor's windscreen.

Top: The IL-28U's forward fuselage (section F1).

Above: The centre/rear fuselage (sections F2/F3 combined).

Left: The navigator's jump seat used for working with the bomb sight and the radar.



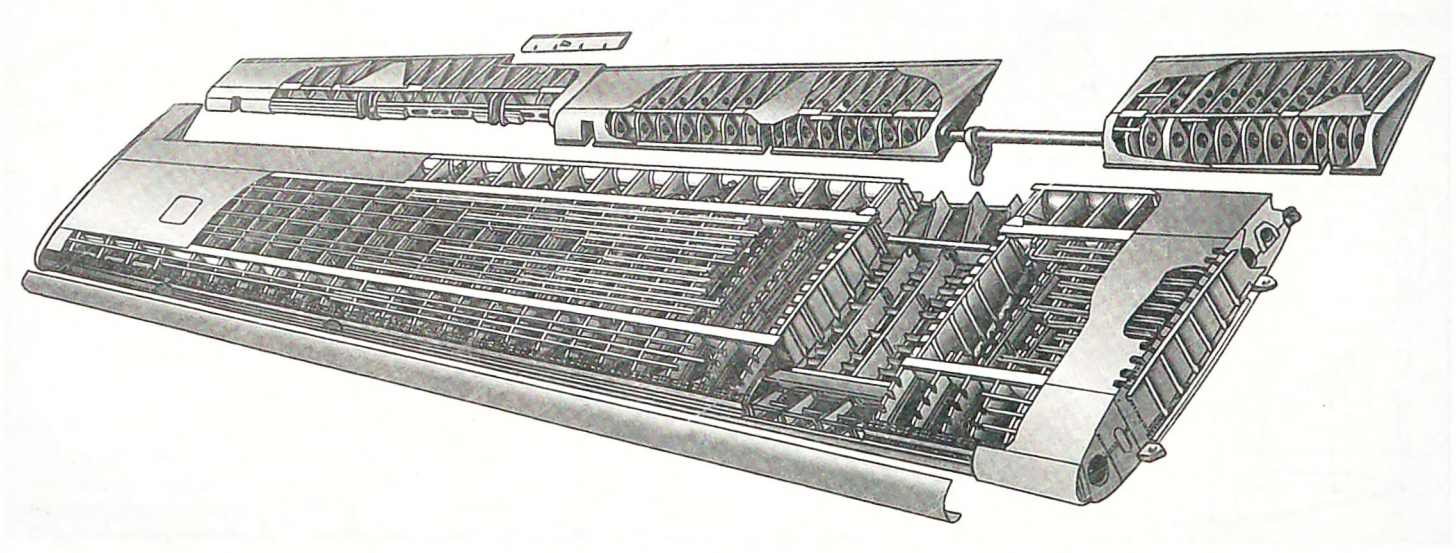


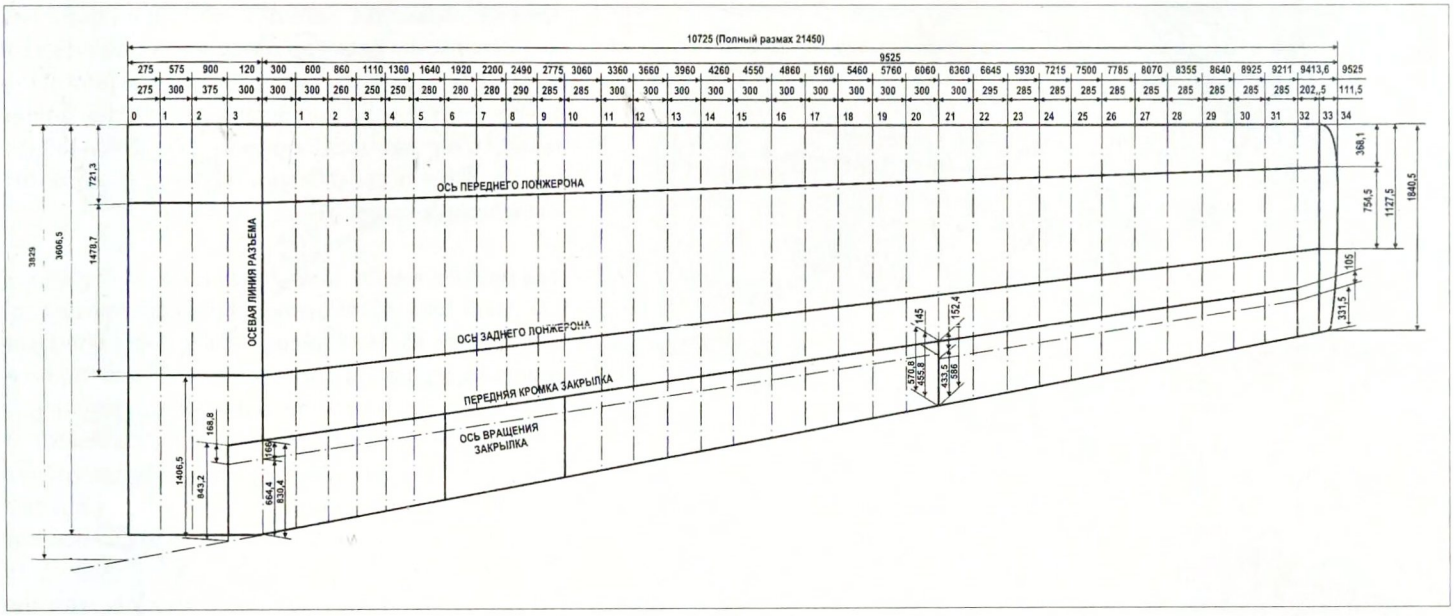
incidence 3°, aspect ratio 7.55, taper 2.08. Root chord 3.834 m (≈ 12 ft 6 15/16 in), tip chord 1.843 m (6 ft 0 35/64 in), mean aerodynamic chord (MAC) 2.955 m (≈ 9 ft 8 1/32 in). The wings utilise a TsAGI SR-5S (P11-1) airfoil with a thickness/chord ratio of 12%.

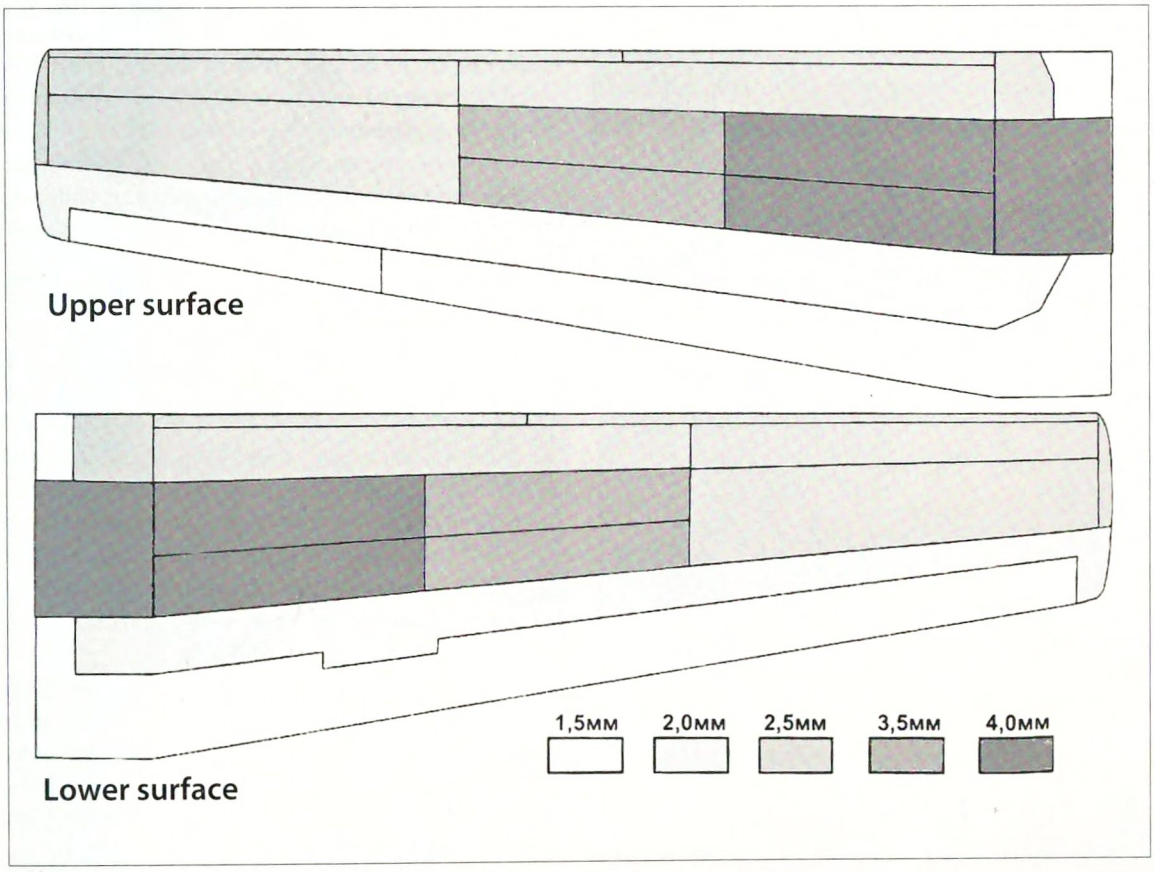
The *centre section*, which is only marginally wider than the fuselage, having a span of 2.4 m (7 ft 10 3/64 in), is located between fuselage frames 21 and 31; the wing/fuselage joint is closed by fairings. The one-piece spars attached to frames 23 and 27 are parallel and, together with the skins reinforced by multiple ribs and stringers, form the wing torsion box which accepts the aerodynamic loads. The centre section has nine ribs (centreline rib 0, 1L-4L and 1R-4R), four of which (those outside the fuselage cross-section) are built in three parts each (front, centre and rear), and 20 stringers (ten above and ten below). All internal structural elements are stamped from duralumin sheet.

The *outer wings* each have 33 ribs and 25 stringers (ten stringers above and ten below inside the torsion box, three stringers above and two below on the leading-edge section). Most of the ribs are spaced 285 or 300 mm (≈ 11 7/32 in or 11 13/16 in). The outer wings have a chordwise manufacturing break; the spars consist of upper and lower T-section caps attached by bolts to the solid sheet web, and most of the ribs consist of six parts (except ribs 6 and 10 flanking the engine nacelle, which are solid); thus, each outer wing is assembled from six panels. The wing skins are 1.5; 2.0; 2.5; 3.5; and 4 mm (0.059; 0.078; 0.098; 0.137; and 0.157 in) thick, becoming thinner towards the tips, and are made of D16A-TV and V95A-TV alloys. Each outer wing is attached to the centre section by twelve 16-mm bolts and two 14-mm bolts at the spars and stringers and 5-mm bolts at the skin joints.

The outer wings have no leading-edge devices (the detachable leading-edge fairings act as de-icers). The outer portions of the trailing edge between ribs 21-32







A drawing from the structural manual showing the numbering and spacing of the wing ribs. The inscriptions read 'Front spar axis', 'Rear spar axis', 'Flap leading edge', 'Flap rotation axis' and (vertically) 'Axis of [centre section/outer wing] joint'.

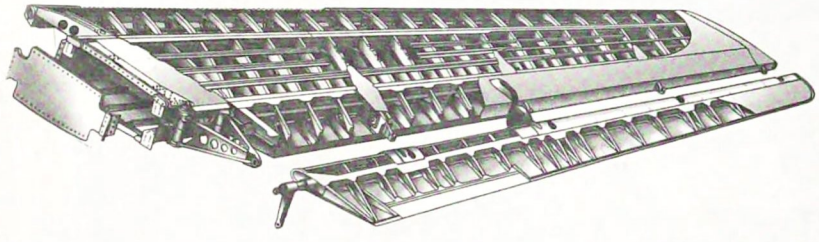
A diagram from the same manual showing the distribution of the wing skin thicknesses.

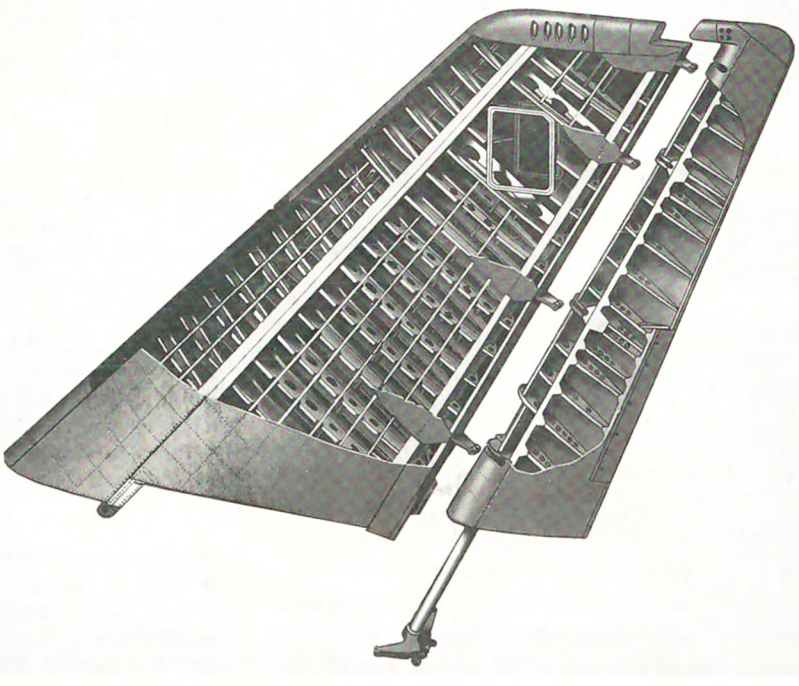
Opposite page, top: The starboard wing with the flaps at 48° maximum deflection.

Opposite page, centre: The wingtip fairings feature de-icing system air outlet grilles; the starboard wing carries a pitot on the bomber version.

Opposite page, bottom: The starboard wing showing the flap design, the leading-edge de-icer and the aileron trim tab.

are occupied by one-piece ailerons making up 5.5% of the wing area, the starboard aileron incorporating a trim tab at the root carried on four hinges. The ailerons are single-spar structures with a skin thickness of 1.5 mm on the leading edge and 0.8 mm elsewhere; each aileron is carried on three hinges, and the travel limits are 20° up and 15° down. The rest of the trailing edge is occupied by slotted flaps making up 12.2% of the wing area, which are divided into two sections by the engine nacelles. The flaps take up 67.5% of the wing span, the outboard sections (ribs 10-21) having twice the span of the inboard ones (up to rib 6) which overlap the outer wing/centre section joint, going all the way to the fuselage. The inboard and outboard sections are attached to a common tubular axle with a bellcrank for the actuator housed inside the engine nacelle. The flaps are hydraulically actuated, with pneumatic emergency extension; flap settings are 20° for take-off and 48° for





landing. Both the ailerons and the flaps are aerodynamically balanced to reduce control/actuator forces. The starboard wing carries the main pitot at the tip rib (No.33R); the non-detachable wingtip fairings feature triple static discharge wicks. On the IL-28R the wingtip fairings are different, featuring locks for the detachable tip tanks.

Tail unit: Conventional swept tail surfaces. The *vertical tail* swept back 41° at quarter-chord comprises a two-spar fin with 45° leading-edge sweep and a one-piece rudder incorporating a trim tab at the root. The fin is structurally similar to the outer wings, featuring a chordwise manufacturing break, and is attached to the fuselage by four bolts (the front fittings mate with frame 38 and the rear ones with the stabilisers). It has two spars, 14 stringers (five on each side in the torsion box and two on each side in the leading-edge section), 15 normal ribs, six partial ribs and a root rib; with the exception of the latter, the ribs are spaced 200 mm (7⅞ in). The single-spar rudder is carried on four hinges (at fin ribs 10, 15, 20 and 23) and a lower support; it is aerodynamically balanced and the upper end features a mass balance. The rudder travel limits are ±25°.

The low-mounted *horizontal tail* comprises cantilever stabilisers and one-piece elevators with trim tabs at the root. Leading-edge sweep 33°, dihedral 7°. The stabilisers, which again are structurally similar to the outer wings, are bolted together on the centreline and attached to the fuselage by four bolts. The elevators are carried on four hinges and are aerodynamically balanced and fitted with a mass balance at less than half-span; the travel limits are 32° up and 13°30' down.

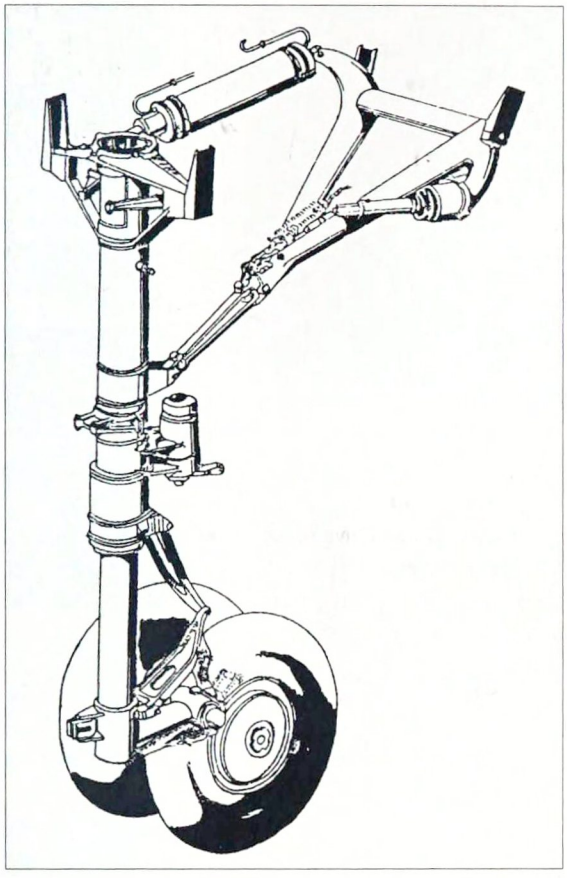
The tail unit utilises NACA 00 series symmetrical airfoils with a thickness/chord ratio of 12-10% (decreasing from the root to the tip – NACA 0012, NACA 0011 and NACA 0010) for the vertical tail and 11-10% for the horizontal tail. The fin and stabiliser tip fairings also feature triple static discharge wicks.

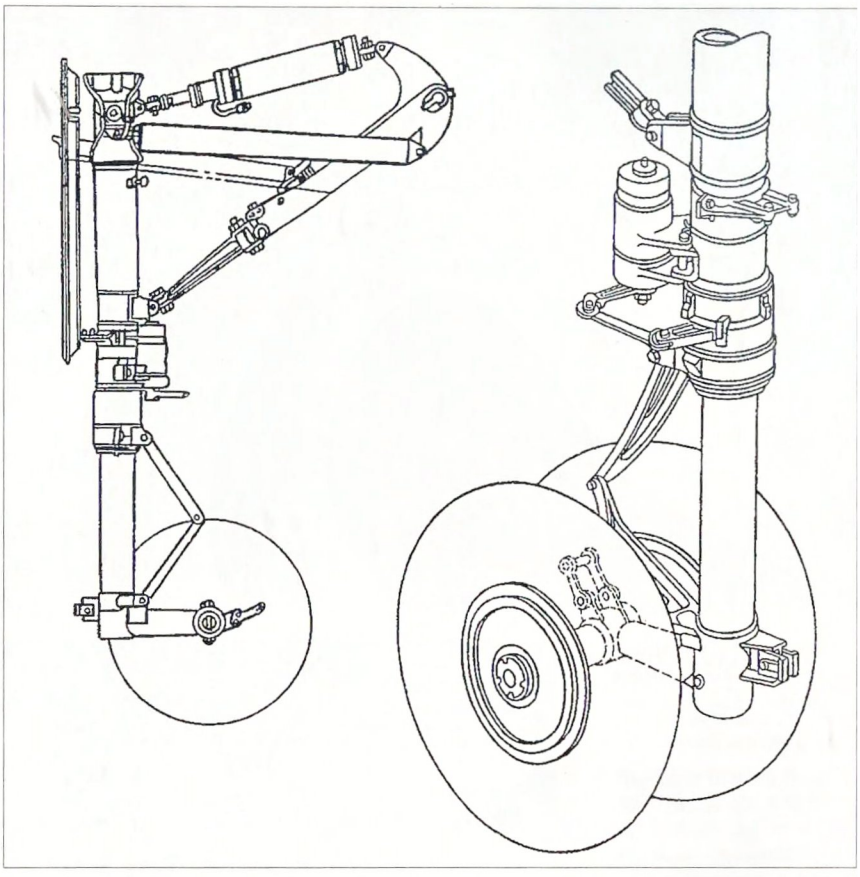
Landing gear: Pneumatically-retractable tricycle type, with back-up pneumatic extension system and a spring-loaded emergency extension feature for the nose gear. The aft-retracting castoring nose unit has twin non-braking wheels – originally 600x155 mm (23.6x6.1 in), later enlarged to 600x180 mm (23.6x7.08 in) or 600x185 mm (23.6x7.28 in). It is equipped with a shimmy damper.

Top left: The tail unit of an IL-28.

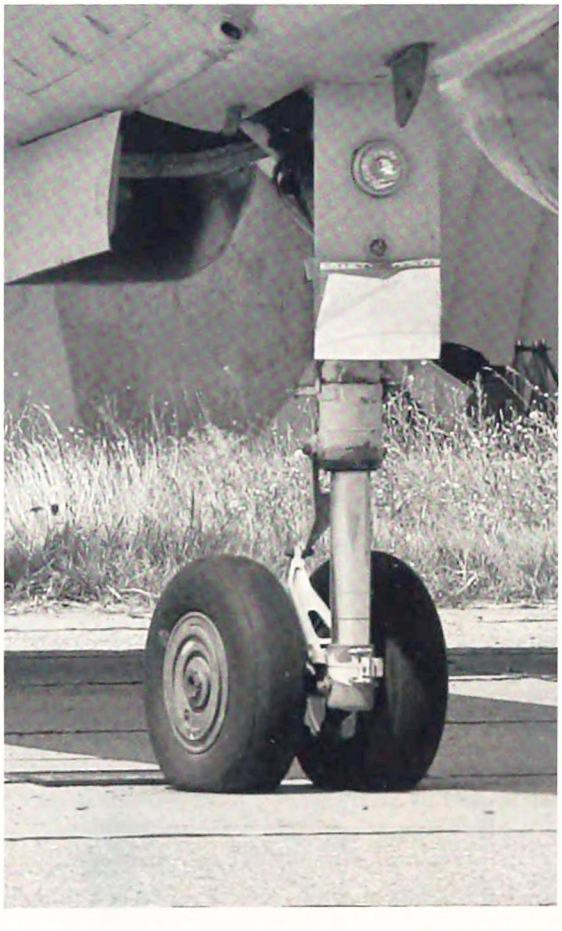
Above left: The starboard stabiliser and elevator. Note the mating plate at the root for joining with the port stabiliser and the elevator bellcrank.

Left: The fin and rudder. Note the box between ribs 17-20 for the KRP-F localiser receiver's slot antenna.

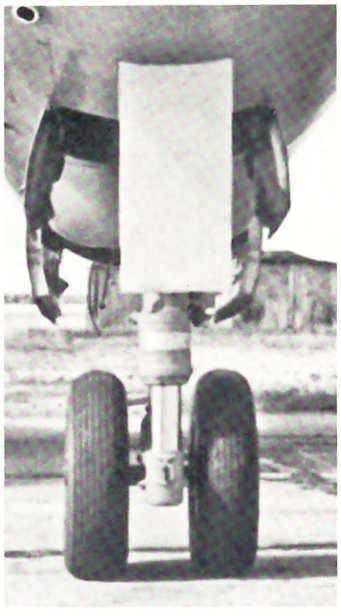


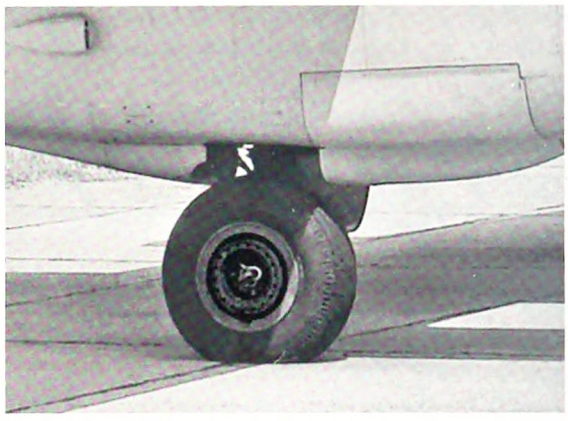


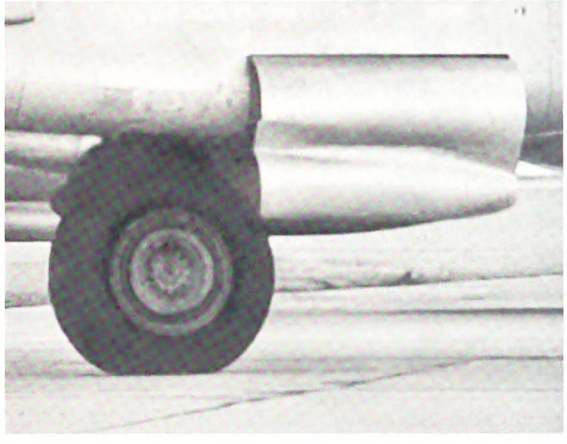
Above and above left: Drawings of the nose gear unit from the structural manual, showing the breaker strut, the actuation ram and the offset shimmy damper.



These photos provide a comparison of the nose gear units of a genuine Soviet-built IL-28 (far left) and a Chinese-built H-5; note the taxi light on the latter's forward wheel well door segment.







Above, right and above right: Three more angles on the nose gear unit.

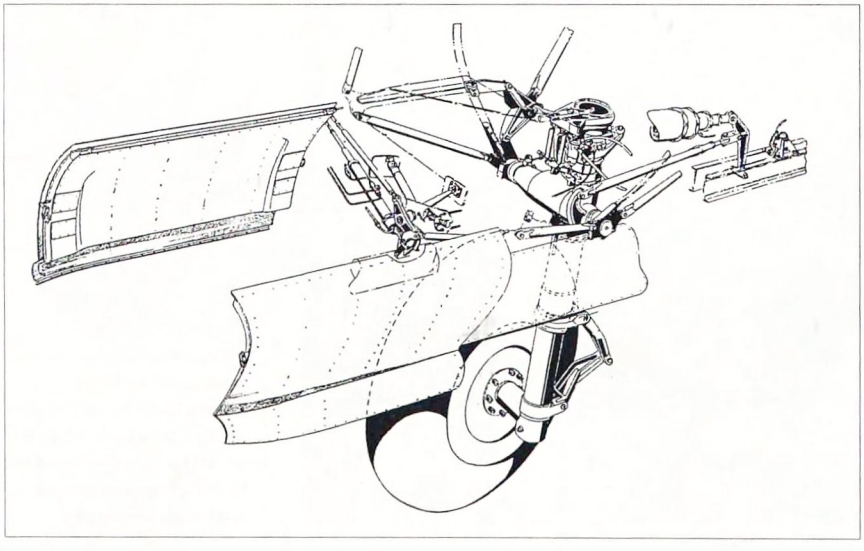
Far right and top right: The starboard main gear unit of the bomber version.

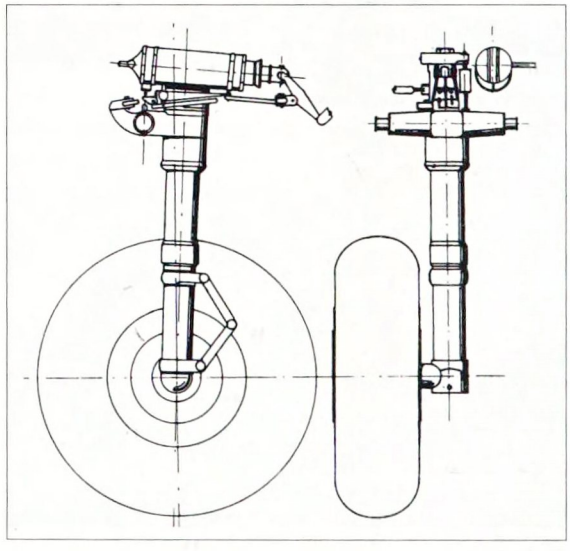
Below: A drawing from the structural manual showing the starboard main gear unit complete with the mounting truss, the actuating rods, the wheel well doors and their actuator.

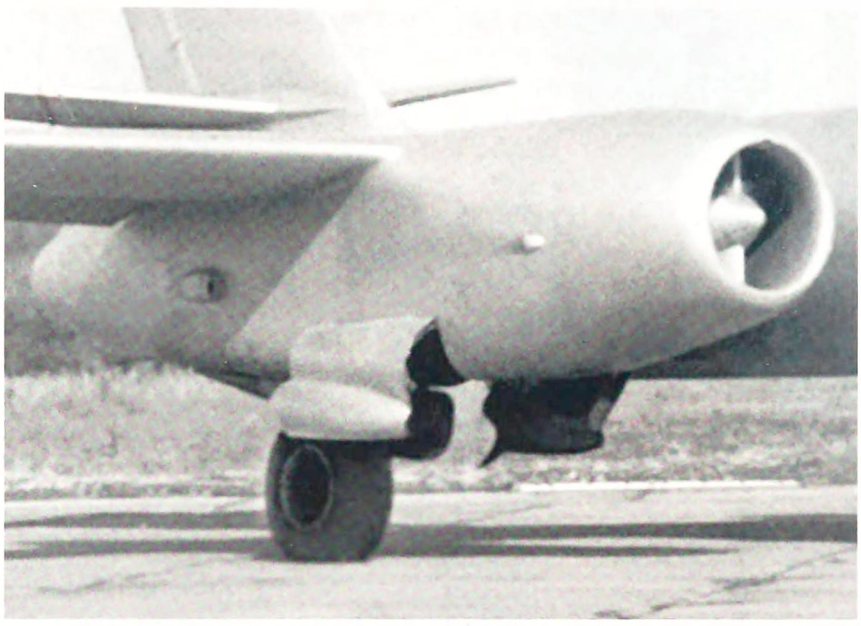
Below right: The same strut and its actuator shown separately.

The main units with single 1,150x355 mm (45.27x13.97 in) wheels equipped with hydraulic brakes are attached to the wing spars via truss-type structures inside the engine nacelles. They retract forward into the lower portions of the engine nacelles, the wheels turning through 90° by means of mechanical linkages to lie flat under the engine jetpipes; the actuating rams are installed back to front and attached to the struts via push-pull rods and bellcranks.

Gear retraction time at 280-380 km/h (174-236 mph) IAS is 18.5-19 seconds; gear extension time at 350-







Two views of the starboard engine nacelle showing the air intake centrebody with engine accessory cooling intakes and the cooling/pressurisation air scoop on the outer side of the nacelle. The ventral fairing encloses the main gear oleo strut when the gear is retracted.

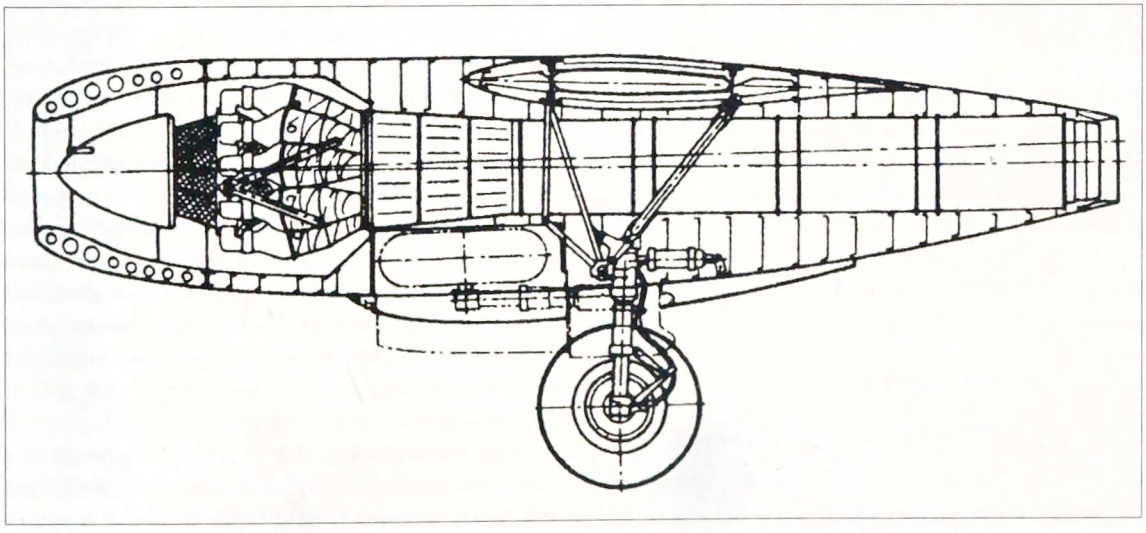
400 km/h (217-248 mph) IAS is 23-24 seconds. Steering on the ground is by differential braking.

On the IL-28R the landing gear is hydraulically-retractable and features reinforced main units with 1,260x390 mm (49.6x15.35 in) wheels. The latter are fitted with a hydraulic wheel spin-up system with GM-13 hydraulic motors to prolong tyre life. Gear retraction/extension time is 8 seconds.

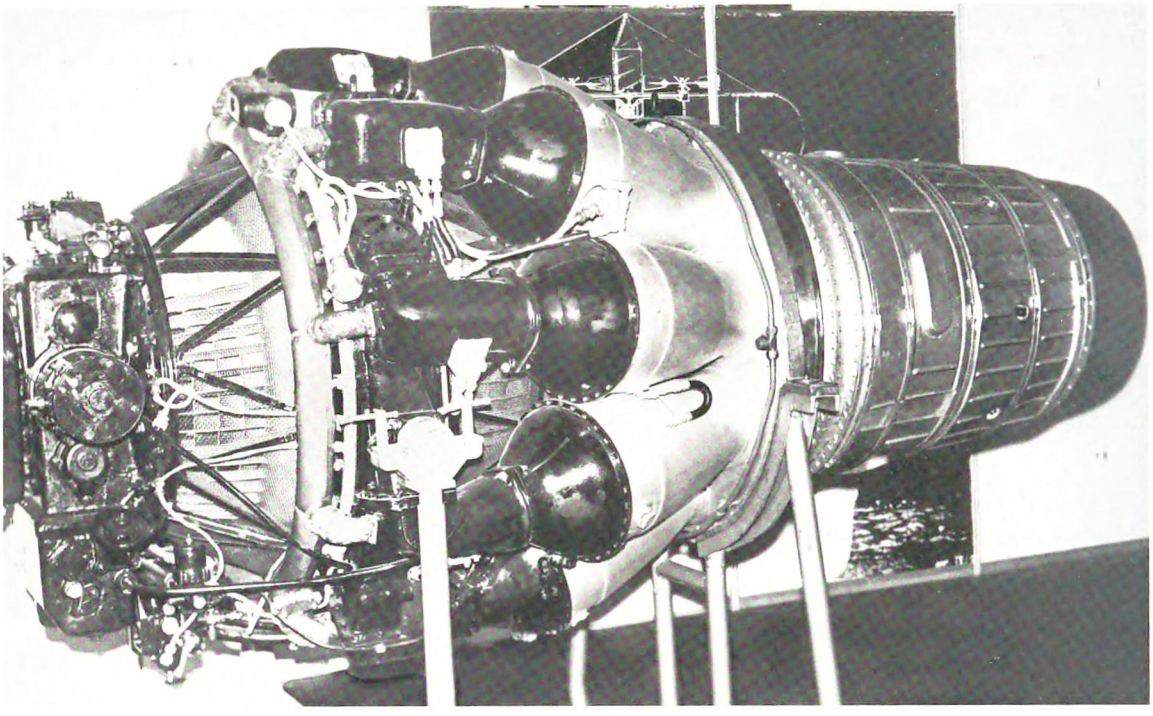
All units have shock absorbers and aft-mounted scissor links. The shock absorbers are filled with a specially formulated IL-660 alcohol/glycerine mixture; the stroke is 518 mm (20$^{25}/_{64}$ in) for the nose unit and 510 mm (20$^{5}/_{64}$ in) for the main units, although some sources state 400 mm (15$^{3}/_{4}$ in) and 300 mm (11$^{13}/_{16}$ in) respectively. Tyre pressure is 4.5 kg/cm^2 (0.315 psi) for the nosewheels and 7-8 kg/cm^2 (0.49-0.56 psi) for the mainwheels. The ground angle in static condition is 1°10' nose-up; the maximum rotation angle is 10°30' in static condition or 12°30' in no-load condition.

The nosewheel well is closed by a forward door segment attached to the nose gear oleo and rear clamshell doors; each mainwheel well is closed by large clamshell doors (having a separate actuator) and a small rear door hinged on the inboard side and mechanically linked to the strut. All doors remain open when the gear is down. Landing gear position is indicated by an USh-48 mechanical indicator (*ooka**za**tel' shas**see*** – landing gear indicator) for the nose unit, down/up position lights and a 'gear up' warning horn that can be silenced by a button on one of the throttles.

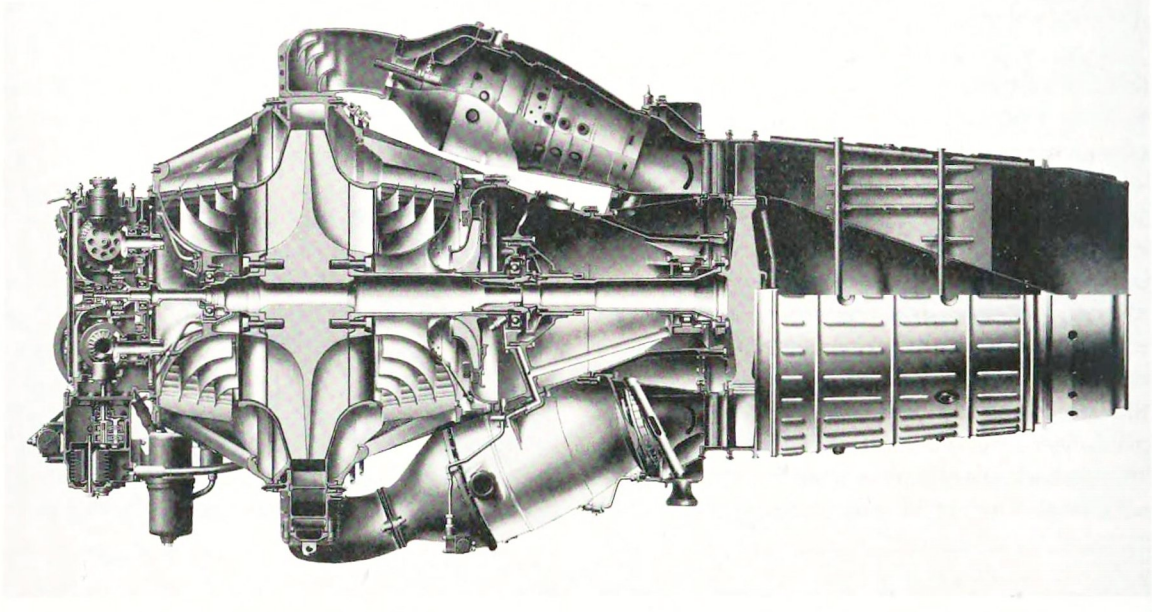
To shorten the landing run some IL-28s are equipped with a PB-28 ribbon-type circular brake parachute of 7 m (22 ft 11$^{13}/_{32}$ in) diameter. The brake parachute container with clamshell doors is built into the rear avionics/equipment bay door, which is aft-hinged; its retaining lock is at frame 38. The parachute deployment and jettison buttons are located on the right-hand horn of the control wheel.



This view shows the position of the starboard VK-1 and its extension jetpipe inside the nacelle, the air intake centrebody enclosing the engine accessories, the main gear mounting truss fitting around the jetpipe and the retracted position of the starboard mainwheel.



A VK-1A turbojet showing the compressor inlet with zigzag struts and a FOD protection wire mesh and the forward-mounted accessory gearbox.



A cutaway drawing of the VK-1 engine; note the sets of curved inlet guide vanes.

Powerplant: Two Klimov VK-1 or VK-1A non-afterburning turbojets, each rated at 2,700 kgp (5,950 lbst) for take-off, 2,400 kgp (5,290 lbst) at full military power and 2,160 kgp (4,760 lbst) for cruise (maximum continuous thrust).

The VK-1 has a single-stage centrifugal compressor (featuring a double-sided annular air intake with a protective wire mesh screen), nine straight-flow combustion chambers, a single-stage air-cooled axial turbine and a fixed-area subsonic nozzle with a conical centrebody carried on cruciform struts. A forward-mounted Type A accessory gearbox is fitted for driving pumps, a compressor and electrical equipment. The engines have remote-controlled air bleed valves.

Engine pressure ratio 4.2, mass flow 48.2 kg/sec (106.2 lb/sec), turbine temperature 1,170°K; specific fuel consumption at take-off thrust 1.07 kg/kgp-hr (lb/lbst-hr), fuel burn 2,890 kg/hr (6,370 lb/hr) at take-off thrust, 2,545 kg/hr (5,610 lb/hr) at full military power, 2,270 kg/hr (5,000 lb/hr) at maximum continuous thrust and 450 kg/hr (990 lb/hr) at ground idle. Operating time limit six minutes at take-off power and 60 minutes at full military power. Engine speed 11,560 rpm at take-off power, 11,200 rpm at cruise power and 2,500 rpm at ground idle.

Maximum diameter 1.28 m (4 ft $2^{25}/_{64}$ in), length less extension jetpipe 2.54 m (8 ft 4 in); dry weight less extension jetpipe 870 kg (1,918 lb).

Starting is by means of an ST2 or ST2-48 electric starter, using on-board battery power or ground power; each engine has its own PS-2-48 start-up control panel on the inboard side of the engine nacelle; the engine starting buttons and ground/in-flight start selector switches are located on the port cockpit console. The engine controls are connected to the throttles located on the port console by a system of cables and pulleys.

The engines are installed in area-ruled nacelles adhering directly to the underside of the wings between ribs 6-10 and are fitted with so-called Type B extension jetpipes 4.125 m (13 ft 6$^{13}/_{32}$ in) long. The nacelles are stressed-skin structures with 26 frames each; the cross-section changes from circular to rectangular with rounded corners (at the 'waist') to circular. Each engine is mounted on a truss-type engine bearer via four attachment points (two trunnions on the sides of the compressor casing below the engine axis and two mounting lugs on the upper side); there is an aft-sloping firewall at frame 10. The front end of each nacelle consists of two annular cowling sections exposing the engine almost completely when detached; the two sections are held together by eight bolts and the rear section is attached to frame 1 by 12 bolts. The front section incorporates a circular air intake with a parabolic centrebody carried on an airfoil-section straight-through vertical pylon and featuring two ram air intakes for cooling the engine accessories. The first and second cowling sections feature four and three detachable access panels respectively. The nacelles also incorporate the mainwheel wells.

To reduce the take-off run, two PSR-1500-15 jet-assisted take-off (JATO) rockets angled outwards and downwards can be fitted under the wing roots, with fittings on the wings and the centre fuselage at frames 27 and 30; they are ignited by pushing a button on the control wheel. Each booster delivers a thrust of 1,650 kgp (3,640 lbst) each, with a burn time of 13 seconds, and weighs 241-246 kg (531-542 lb). The boosters are held in place by D3-40 shackles and jettisoned pyrotechnically by means of PP-3 cartridges (***pee**ropat**ron***) after burnout at the push of a button on the pilot's port cockpit console.

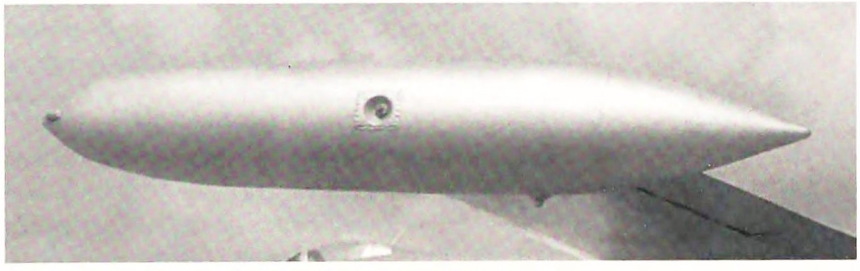
Control system: Unpowered mechanical flight controls throughout. The cockpit is equipped with a control column featuring a W-shaped control wheel. Roll control is by means of ailerons, which are connected to the control wheel by push-pull rods and bellcranks. Pitch control is by means of elevators, the elevator control circuit featuring a combination of push-pull rods at the front and cable control runs at the rear. Directional control is by means of a rudder which utilises a similar combination of rigid and cable linkages; all control surfaces are aerodynamically balanced to reduce the control forces. The starboard aileron, the rudder and both elevators feature trim tabs; the elevator trim tabs are mechanically operated by means of a handwheel on the port cockpit console via a system of cables, while the aileron and rudder trim tabs are operated by UT-2 electric actuators (*oopravl**en**iye **trim**merom* – trim tab control).

An AP-5 or AP-5-2 electric autopilot is installed, with a yaw stabiliser at the navigator's station and a pitch/roll stabiliser at frames 18-18B. The autopilot allows the pilot or the navigator to adjust the aircraft's heading and enables turns with up to 18° bank. The rudder and elevator servos are located at frames 38-39 (to starboard and to port respectively); the aileron servo is on the starboard side between frames 27-28.

The IL-28U trainer has full dual controls allowing it to be flown from either cockpit.

Fuel system: On most versions, all fuel is carried in the fuselage in five self-sealing bladder tanks (fuel cells) which are housed in containers ahead and aft of the wings (No.1, frames 11A-15; No.2, frames 15-18; No.3, frames 18-21; No.4, frames 29-32; No.5, frames 32-36). The walls are 3.3-10.8 mm (0$^{1}/_{8}$-0$^{27}/_{64}$ in) thick. On the standard bomber the overall fuel capacity is 7,908 litres (1,739 Imp gal) and the fuel load is 6,600 kg (14,550 lb). The fuel grades used are T-1 or TS-1 jet fuel or equivalents (Czech PL-1, Western Jet A-1 etc.).

Refuelling is by gravity via individual filler caps. The front (Nos. 1-3) and rear (Nos. 4 and 5) groups of tanks



The IL-28R's tip tanks featuring navigation lights at the front and ventral defuelling valves at the rear.

each have their own filter and electric transfer pump. Either engine can draw fuel from any group of tanks, but a valve disabling cross-feed is provided. The fuel quantity is indicated by gauges and low fuel warning lights for the two groups of tanks. Each engine has its own PNR-45 start-up feed pump (*poosko**voy** na**sos**-rego**olya**tor*). Moscow-built aircraft from c/n 530512705, Voronezh-built aircraft from c/n 6450606 and Omsk-built aircraft from c/n 1016601 onwards had ART-8 automatic fuel control units (*avtoma**tich**eskiy rego**olya**tor **top**liva* – FCU) on the engines.

The IL-28R reconnaissance version features modified fuselage tanks with a total capacity of 7,650 litres (1,683 Imp gal) and detachable 950-litre (209 Imp gal) cylindrical metal tanks at the wingtips increasing the overall capacity to 9,550 litres (2,101 Imp gal). Fuel is transferred from the tip tanks to the main tanks by bleed air pressure. The tip tanks can be jettisoned in an emergency. The IL-28U trainer's fuel capacity is 6,600 litres (1,452 Imp gal).

To reduce the risk of fire and explosion if pierced by enemy projectiles, the fuel tanks feature an inert gas pressurisation system using carbon dioxide from two 8-litre (1.76 Imp gal) cylindrical bottles with pyrotechnic valves installed on the port side of the bomb bay between frames 23-24 and at frame 28. The system is activated manually by the pilot by pushing a button. The space between the tanks and the container walls is also filled with CO_2. The IL-28U lacks the inert gas pressurisation system.

Electric system: Primary 27-28.5 V DC power is provided by two 9-kilowatt GSR-9000 (later two 12-kilowatt STG-12000) engine-driven starter-generators with R-25A voltage regulators. As a back-up, two 12-A-30 lead-acid DC batteries (24 V, 30 A·h) are installed in the centre fuselage on both sides between frames 37-38. Most of the equipment (the fuel pumps, the engine bleed air valves, the lighting equipment etc.) uses DC power.

115 V/400 Hz three-phase AC power for the PSBN-M radar, the command radio, the DME, the RV-10 radio altimeter, the ADF and the tail turret's controls is supplied by two 250-VA MA-250M rotary converters (*mo**tor**-al'ter**nah**tor*) housed in the cockpit on the port side (frames 7-8) and in the rear avionics/equipment bay (frames 36-37), a 500-VA MA-500 rotary converter in the nosewheel well on the starboard side (frames 11-12) and a 1.5-kVA MA-1500K rotary converter located between frames 12-13; the MA-1500K caters only for the radar. Aircraft with the original IL-K6 tail turret had a 100-VA MA-100 rotary converter powering the turret's control system; this was deleted on aircraft with the IL-K6-51 turret powered from AC buses. Furthermore, a separate PAG-1F AC converter provides 36 V/400 Hz three-phase AC for the artificial horizon (hence PAG for *preobrazo**vah**tel' **a**viagori**zon**ta*) and gyro compass. A PO-45 17.5 V/125 Hz single-phase AC converter (*preobrazo**vah**tel' odno**fahz**nyy*) is installed at frame 18B on the starboard side to cater for the autopilot. The IL-28N nuclear-capable bomber has 3-kVA PO-3000 and PO-3000A (main and back-up) AC converters catering for the RBP-3 radar and other avionics, as well as electric heaters in the bomb bay.

The electric system has a single-wire layout (i.e., the airframe acts as the 'minus' wire). Power distribution boxes are located on both sides at frames 20-21 and on the port side at frame 38 to facilitate installation and maintenance of the wiring bundles running along the fuselage sides. Fuses and bimetallic overload protection devices are incorporated. The central power distribution panel with circuit breakers and ammeters is located on the starboard side of the navigator's station (frames 4-6). Two ground power receptacles are provided on the port side between frames 37-38; one of them is used solely for engine starting.

Cockpit lighting is by means of KLSRK-45 white lamps and ARUFOSh-45 ultraviolet lamps (*arma**too**ra **ool'**trafio**let**ovovo osve**shche**niya shar**neer**naya* – 'articulated UV lighting fixture, 1945 model') which provides adequate lighting without revealing the aircraft position to outside observers (read: enemy fighter pilots) at night. Lighting is provided in the bomb bay and the avionics bays. Exterior lighting equipment comprises port (red) and starboard (green) BANO-45 navigation lights (*borto**voy** **a**eronavigatsi**on**nyy o**gon'***), a KhS-39 white tail navigation light (*khvosto**voy** sig**nahl*** – tail signal) on the tail turret fairing, as well as LFSV-45 retractable landing/taxi lights (***lam**pa-**fa**ra samo**lyot**-naya vydvizh**na**ya*) in the outer faces of the engine nacelles (on the second cowling ring). On most versions the port and starboard navigation lights are built into the wingtip fairings and closed by flush-fitting Plexiglas covers. On the IL-28R they are positioned on the outer sides of the tip tanks and closed by small teardrop fairings. For night operations, blue PSSO-45 formation lights are installed on the wings' upper surface and undersurface (ribs 32-33) and on the centre fuselage (two dorsally at frame 32 and two ventrally at frame 33).

Hydraulic system: The hydraulic system operates the flaps, wheel brakes and, on the IL-28R, the landing gear actuators and mainwheel spin-up motors. Hydraulic power is provided by a GNP-1 piston-type pump (***ghid**rona**sos** **ploon**zhernyy*) driven by the port engine, with two hydraulic accumulators installed on the port side at frames 18 and 18B as a back-up. Nominal pressure is 110 kg/cm^2 (1,571 psi). The system uses MVP grade mineral oil (not specifically developed as a hydraulic fluid) and the total capacity is 45 litres (9.9 Imp gal); the hydraulic tank is housed in the port engine nacelle (frames 9-10).

Pneumatic system: The pneumatic system operates the landing gear (on all versions except the IL-28R), bomb bay doors, gunner's station entry hatch and the canopy/entry hatch perimeter seals. In an emergency it is also used to deploy the flaps, operate the wheel brakes and jettison the navigator's hatch cover. Compressed air is stored in seven 4-litre (0.88 Imp gal) spherical bottles at frames 20, 29 and 37 which are charged on the ground via a connector on the port side at frame 18 and topped up in flight by AK-150, Model 280B or Model 280V engine-driven compressors; two of them are 'hot reserve' bottles for emergency operation, including one for the bomb bay doors. Nominal pressure is 150 kg/cm^2 (2,142 psi); reduction valves are provided to reduce it to 55 or 45 kg/cm^2 (785 or 642 psi).

De-icing system: Hot-air de-icing on the wing leading edges, tail unit leading edges and engine air intakes, using engine bleed air. The hot air exit louvres are located on the wing, stabiliser and fin tip fairings (in the case of the fin, on both sides). On the IL-28R the wing de-icers are modified so that the exit louvres are located on the wing underside just inboard of the tip tanks. The system includes de-icer operation valves and temperature sensors (with TTsT-9 thermometers) preventing local overheating of the structure. The pilot's and navigator's windscreens, pitot heads and static ports are electrically de-iced.

Pressurisation and environmental control system: The crew is accommodated in ventilation-type pressurised cockpits; the canopy and the navigator's (or instructor's) and gunner's entry hatches have inflatable perimeter seals pressurised to 3-4 kg/cm^2 (42.8-57.14 psi). Up to an altitude of 2,000 m (6,560 ft) the cockpits are pressurised by ram air from two air scoops on the engine nacelles; the air is warmed up in heat exchangers in the nacelles. At higher altitude the system automatically switches to engine bleed air. In so doing the cockpit pressure exceeds the ambient pressure, decreasing slowly as the aircraft climbs; for example, at 12,000 m (39,370 ft) the cockpit pressure equals 4,250 m (13,940 ft) above sea level. The cockpit temperature at this altitude is 17-18°C (62.6-64.4°F). The system also demists the pilot's cockpit windshield, the navigator's forward glazing panel and the gunner's station glazing. An SOPD-52 decompression indicator (*signali**zah**tor o**pahs**novo pere**pah**da dav**len**iya* – dangerous pressure differential indicator) with a warning bell is provided in each pressure cabin.

Aircraft built from the first quarter of 1954 onwards had the system modified to enable heating of the pressure cabins on the ground by engine bleed air. Additionally, the crew stations have special electric connectors for the heaters integrated into the crew's flying outfits.

Oxygen system: The crew is provided with individual breathing apparatus and KM-14 or KM-16A oxygen masks (*kislo**rod**naya **mahs**ka*). From Moscow-built IL-28 c/n 530512609, Voronezh-built c/n 6450508 and Omsk-built c/n 1216601 onwards the original KP-14 breathing apparatus were replaced with KP-18s for normal operation.

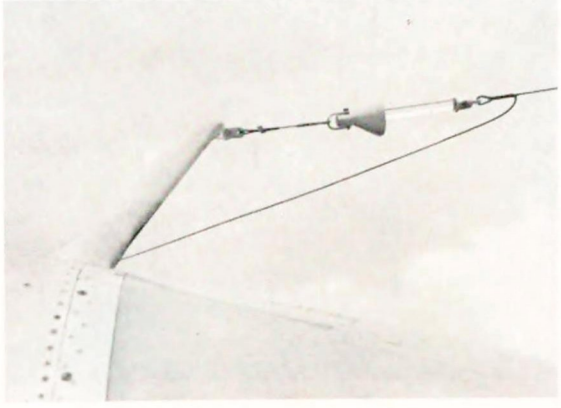
Gaseous oxygen is stored in 12 (or, from 1954 onward, 15) 2-litre (0.44 Imp gal) spherical bottles installed in the rear avionics/equipment bay between frames 36-37; the total supply is thus 24 or 30 litres (5.28 or 6.6 Imp gal). The charging connector is located on the starboard side at frame 38. A VS-46 cabin altitude indicator (*vy**sot**nyy signali**zah**tor*) tells the crew when it's time to don the oxygen masks. On the IL-28R the oxygen supply is increased due to the longer endurance.

To enable safe ejection/bailing out at high altitude (see Rescue equipment) the crewmen are provided with KP-23 breathing apparatus with enough oxygen to last for the descent from up to 13,000 m (42,650 ft) to an altitude where normal breathing is possible. The KP-23 is activated automatically by disconnecting the hose of the normal breathing apparatus.

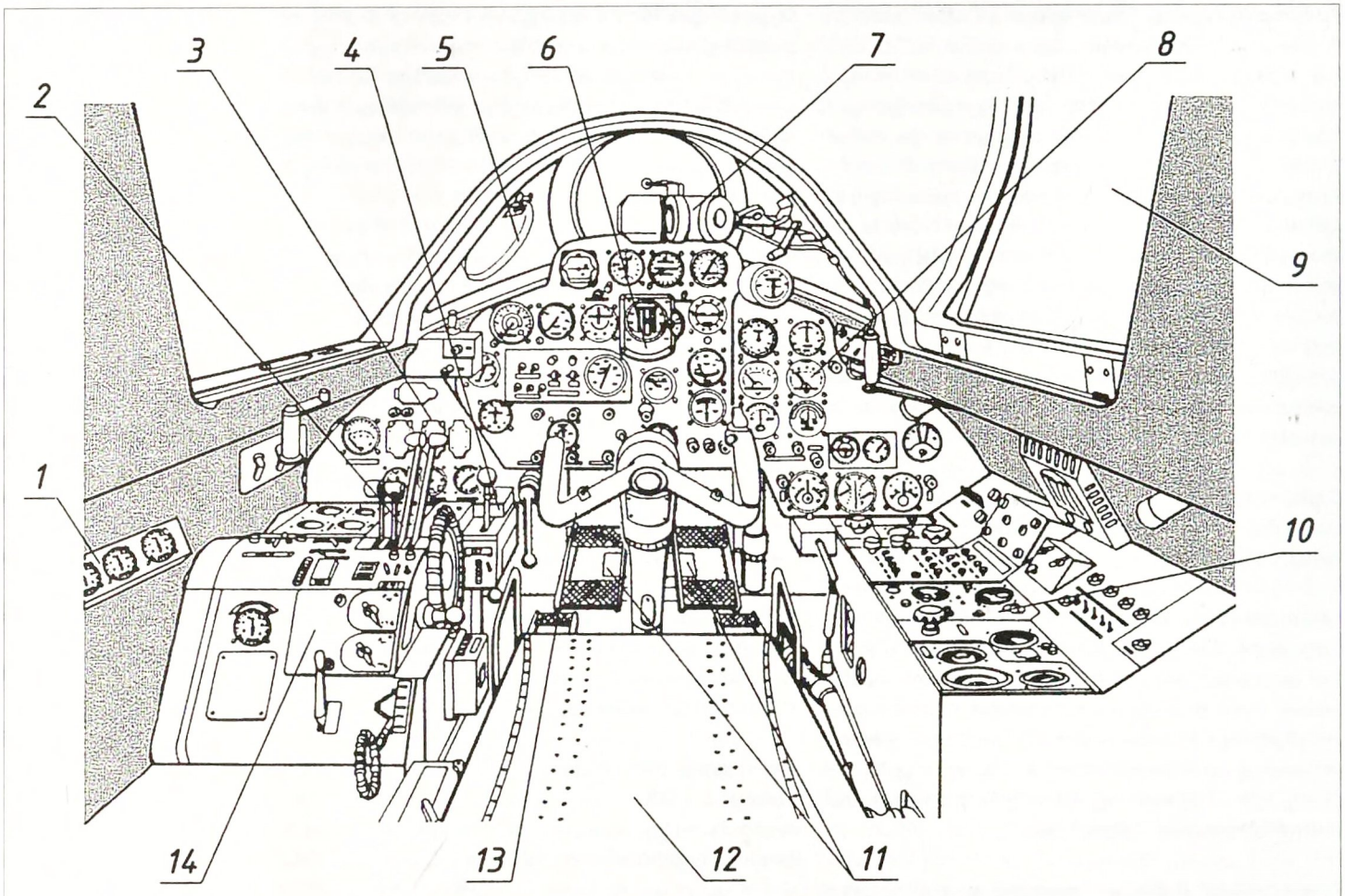
Fire suppression system: The engine nacelles are equipped with flame sensors. Engine fires are extinguished by a two-shot fire suppression system featuring two 8-litre spherical bottles charged with CO_2 in the bomb bay at frame 23. When the fire warning system goes off, the pilot shuts down the affected engine and pushes a button to activate a pyrotechnic valve, letting out the CO_2 via a distribution manifold located in line with the engine's turbine. Fire warning sensors are also provided in the No.2 fuel tank container.

Avionics and equipment: The IL-28 features a comprehensive avionics suite enabling the aircraft to operate at night and in any weather.

a) piloting and navigation equipment: AP-5 or AP-5-2 electric autopilot, OSP-48 instrument landing system on early Moscow-built aircraft (comprising an ARK-5 Amur ADF in a dielectric fairing immediately aft of the cockpit



The aerial mast aft of the cockpit with a steel cable to which the combined radio/ADF wire aerial is attached via an insulator.

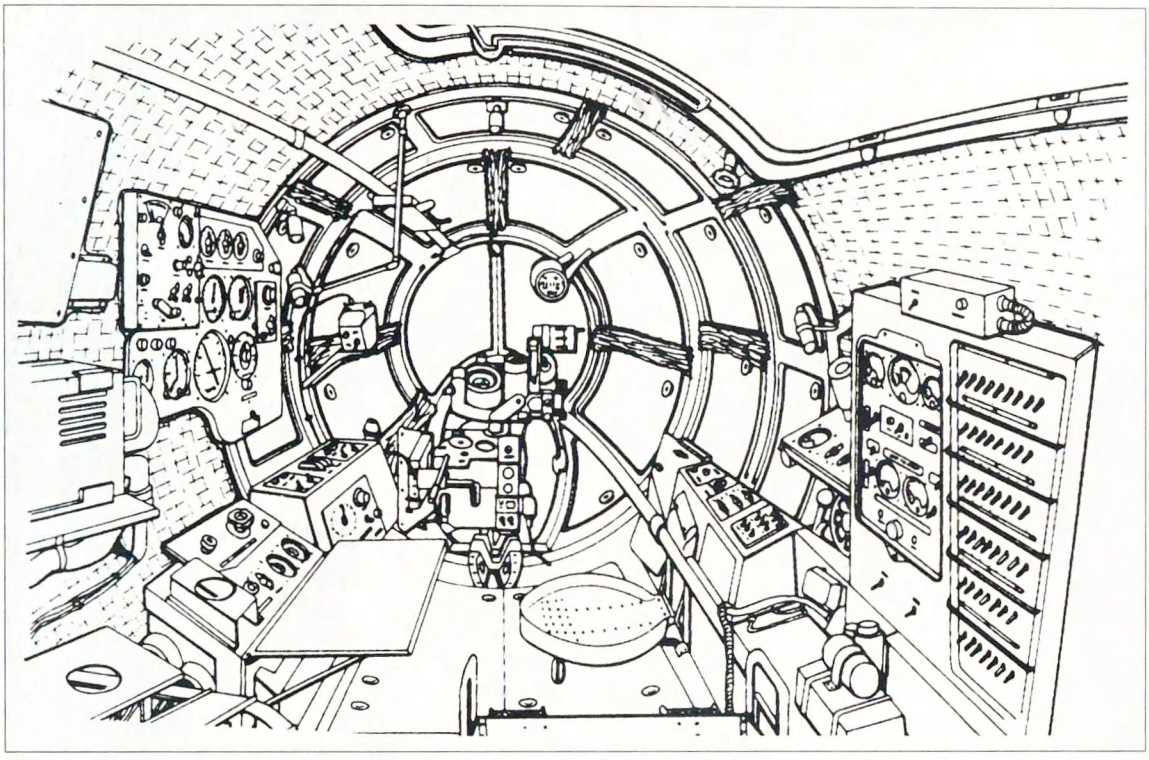


The IL-28's cockpit controls

1. De-icing system control panel
2. Throttle levers, with the elevator trim tab handwheel on the right
3. Port instrument panel section with inert gas pressurisation system and fire suppression system controls
4. Flap control handle
5. Inward-opening direct vision window
6. Centre instrument panel section with flight instruments
7. PKI-1 gunsight
8. Starboard instrument panel section with engine instruments
9. Hinged canopy section, with canopy jettison handle below it
10. Starboard cockpit console
11. Rudder pedals (with brake pedals at the top)
12. Ejection seat with a dished pan for the pilot's parachute
13. Control column and aileron control wheel (with various auxiliary controls)
14. Port cockpit console

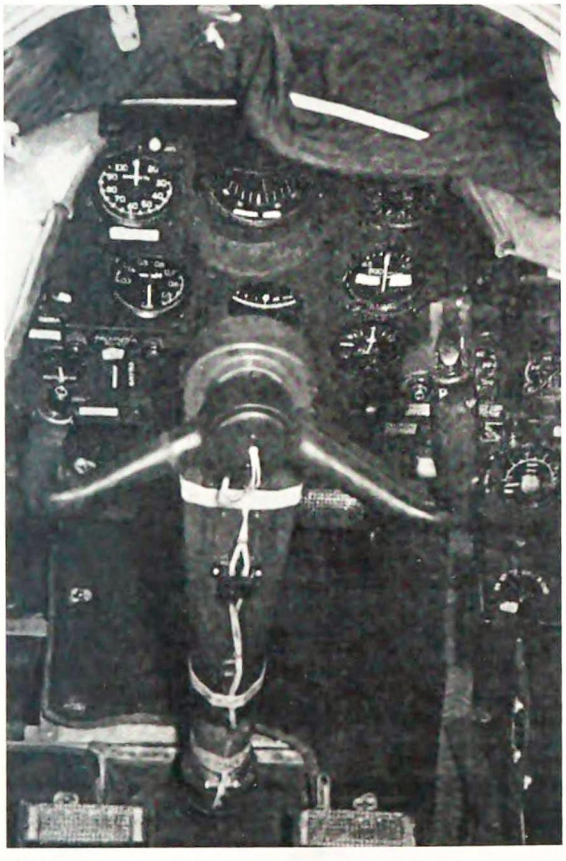
(with a co-located buried RMD loop aerial and a non-directional wire aerial running from the cockpit to the fin), an RV-2 Kristall low-altitude radio altimeter (0-1,200 m; 0-3,940 ft) and an MRP-48 Dyatel marker beacon receiver), RV-10 high-altitude radio altimeter (0-12,000 m; 0-39,370 ft); the RV-10 is not fitted to the IL-28U. The RV-2's dipole aerials are installed inboard of the engine nacelles between outer wing ribs 3L/4L and 3R/4R; those for the RV-10 are similarly installed between outer wing ribs 1L/2L and 1R/2R. Moscow-built IL-28s from c/n 50301201 onwards, as well as all Omsk-built and Voronezh-built production IL-28s, had an SP-50 Materik ILS comprising a KRP-F localiser receiver, a GRP-2 glideslope beacon receiver (both at frames 36-37), an MRP-48P Khrizantema marker beacon receiver at frames 17A-18, with an aerial at frames 18B-19, and an SD-1 VOR/DME receiver. The latter has two measurement ranges, 0-30 km and 10-150 km (0-18.6 miles and 6.2-93 miles). The two-pronged GRP-2 aerial and the flush KRP-F slot antenna are built into the fin near the top; the short unswept rod aerials for the DME are located in tandem under the rear fuselage at frames 31 and 37-38. A PDK-45 (or, on aircraft built from the second half of 1953 onwards, PDK-10) sensor for the DGMK-3 remote flux-gate compass (*distantsi**on**nyy **ghee**romag**nit**nyy **kom**pas*) is buried in the starboard wing underside between ribs 29R/30R

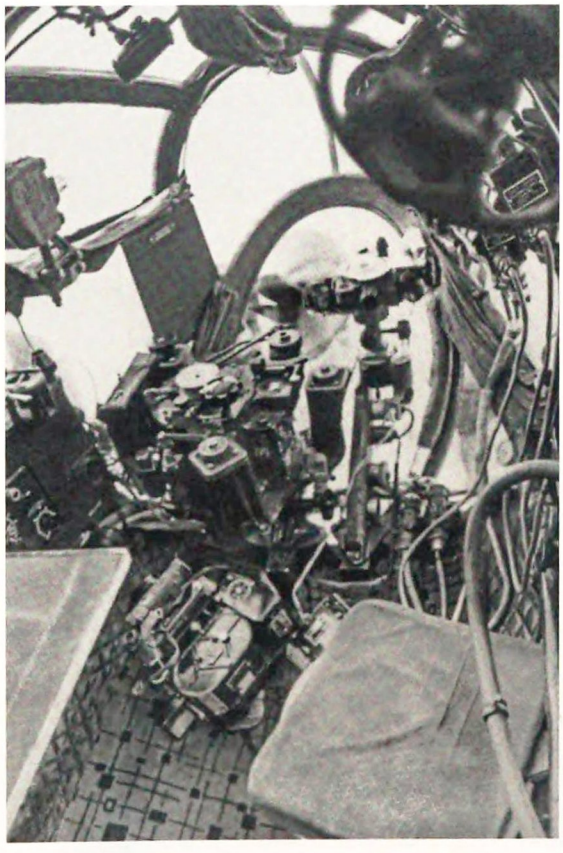
b) communications equipment: For air-to-air and air-to-ground communication the IL-28 has an RSU-5 (on early production aircraft) or RSIU-3M (alias R-800) VHF command radio in the pilot's cockpit, with a frequency range of 130 kHz – 30 MHz and an AShS-1



The navigator's station, with the instrument panels and map table on the left (opposite the jump seat) and the central electrics distribution panel on the right (beside the ejection seat).

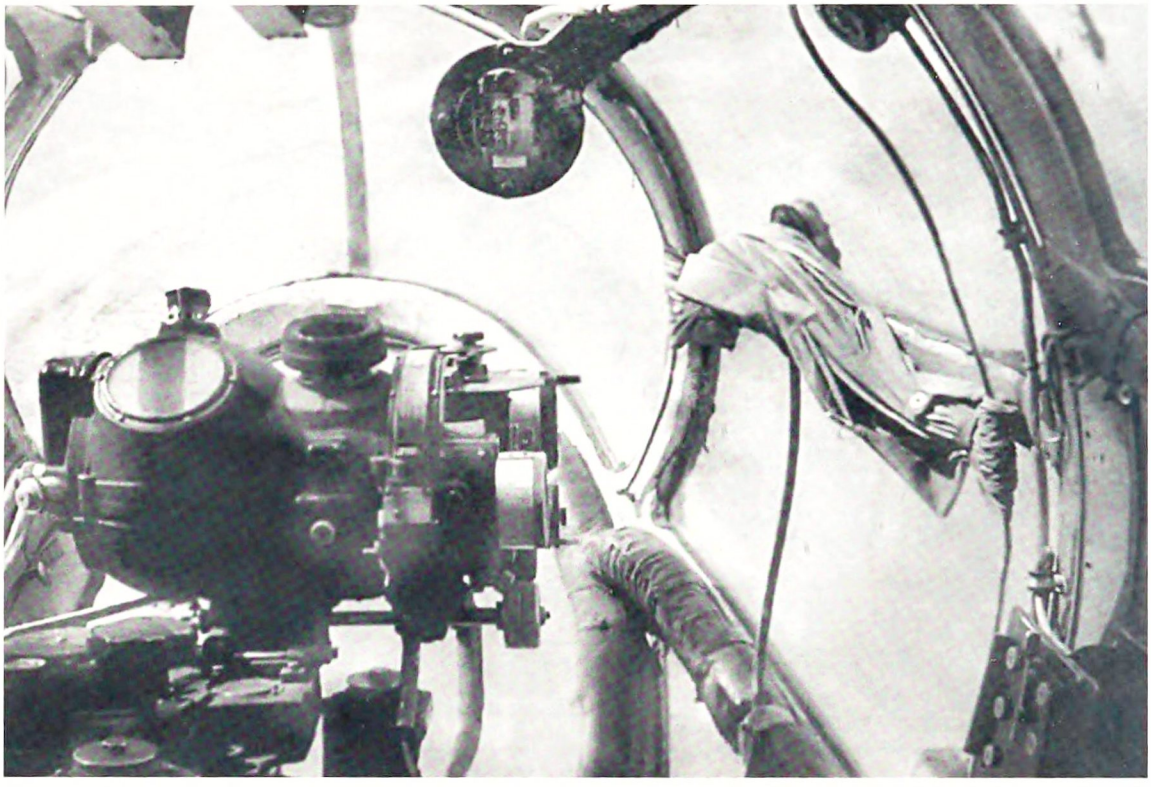
swept blade aerial (*an**ten**na shtyre**va**ya strelo**vid**naya*) low on the starboard side between frames 10-11, and an RSB-5 (***rah**dio**stahn**tsiya bombardi**rov**shchika* – bomber-type radio; alias R-805) HF communications radio in the rear pressure cabin at frames 42-43, with a frequency range of 100-150 MHz and a wire aerial running from an aerial mast immediately aft of the cockpit to the port side of the rear fuselage. An SPU-5 intercom (*samo**lyot**noye perego**vor**noye oo**stroy**stvo*) is provided for crew communication. Connectors for





Far left: The cockpit of an IL-28R. The blind flying training hood is visible at the top.

Left: The interior of the navigator's station. Note that the floor has been covered with linoleum and a cushion has been added to the jump seat, introducing a bit of 'home comfort'.



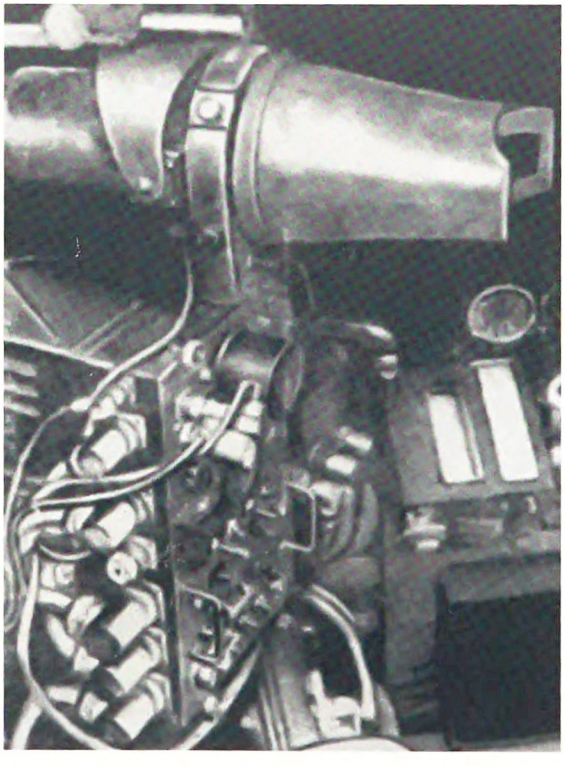
Above: The OPB-5S bomb sight of an IL-28 fitted with the Rym-S targeting system.

external headsets are provided in several places to enable aircrew-to-ground crew communication during pre-flight procedures.

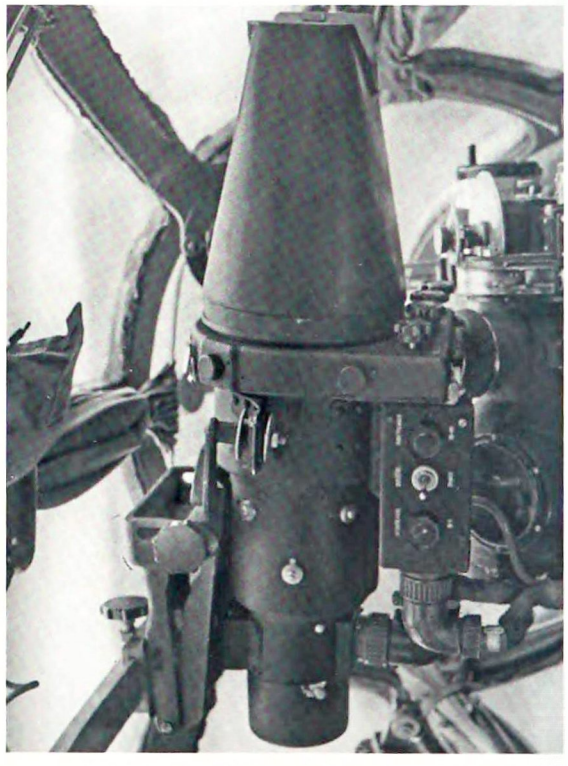
For air-to-ground communication in radio silence mode (for example, in the event of a radio failure) three EKSR-46 signal flare launchers (*elektrifi**tsee**rovannaya kas**set**a sig**nahl'**nykh ra**ket***) are installed above one another low on the starboard side of the forward fuselage immediately aft of the nosewheel well (frames 11A-11B). Each launcher fires four 26-mm (1.02-in) flares of different colours (red, green, yellow and white).

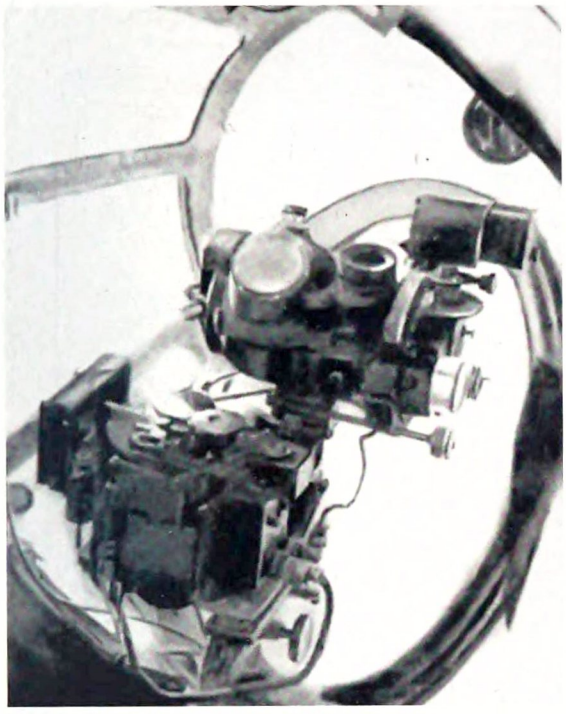
c) cockpit instrumentation: AGK-47B electric artificial horizon, GPK-46 pneumatic gyro compass or GPK-48 electric gyro compass (***ghee**ropolu**kom**pas*), DGMK-3

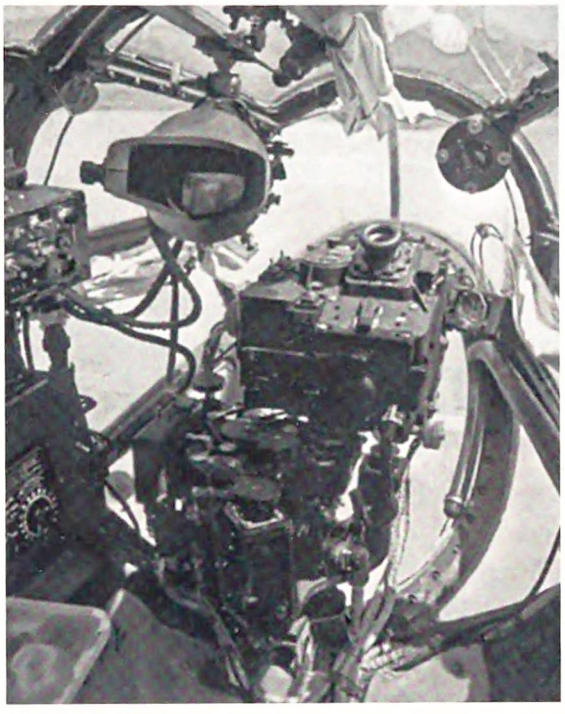
The radarscope of the PSBN-M radar with its rubber sunblind. Here it appears to be simply placed on top of one of the avionics modules.



Far right: Here the radarscope is at its proper location on a hinged mounting that allows it to be tilted into position for use.







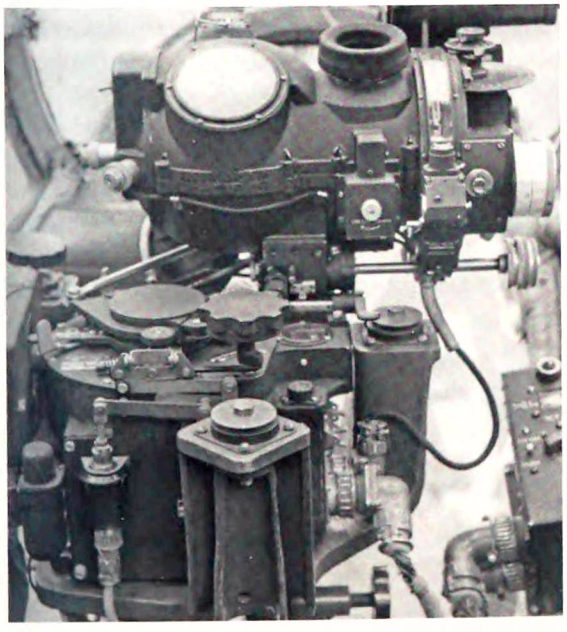
Far left: Another view of the OPB-5S optical bomb sight of a radar-less IL-28.

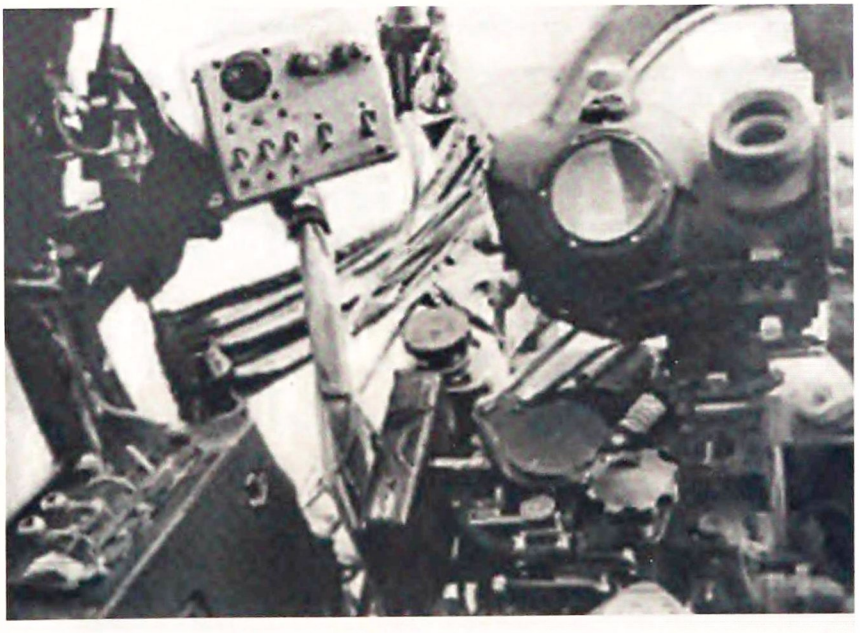
Left: Here, in contrast, is the OPB-6SR sight of an IL-28 fitted with a radar. On this particular aircraft the radarscope is suspended from the top of the glazing frame.

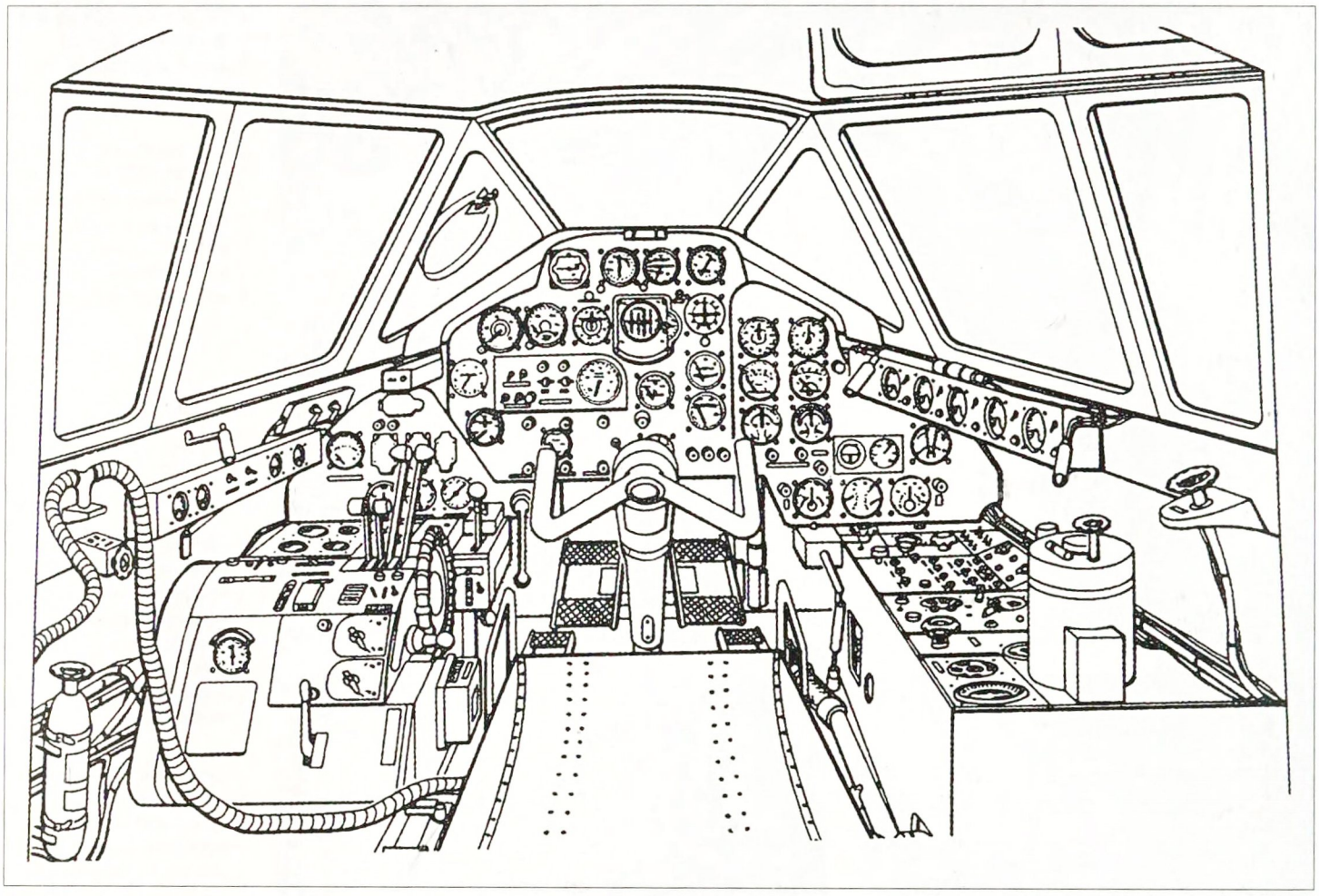
Far left: The navigator's main instrument panel featuring the PSBN-M radar switch (top left), the ASI and altimeter (centre row), ADF indicator and KI-11 compass.

Left: A slightly different version of the navigator's main instrument panel with the SD-1 DME indicator added to the right of the KI-11 compass.

Below and below left: Two more views of the OPB-5S bomb sight.



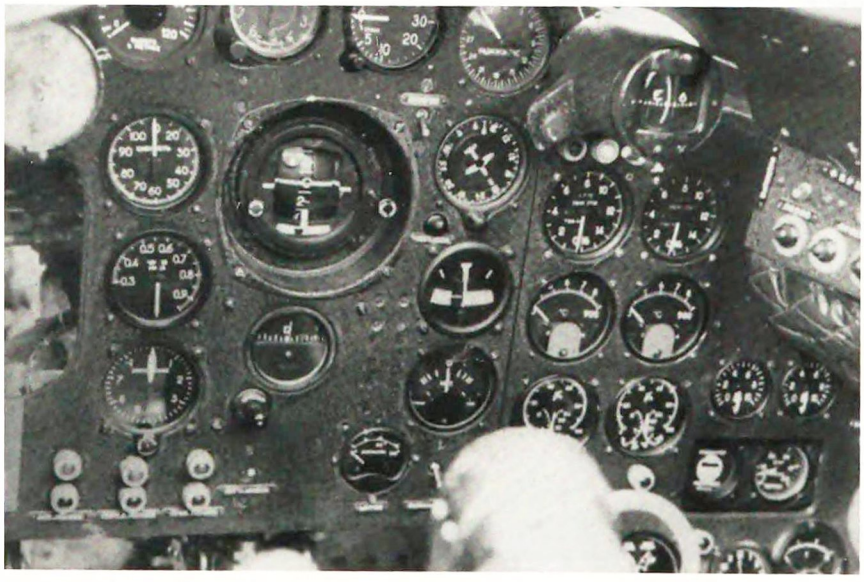




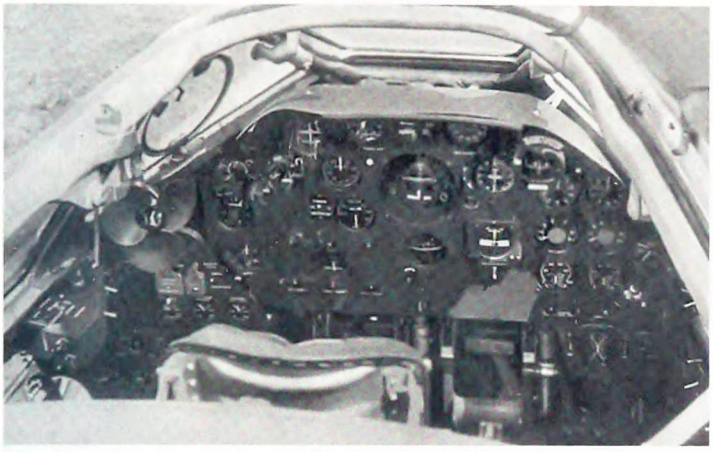
Above: The instructor's cockpit of the IL-28U with the entry hatch open.

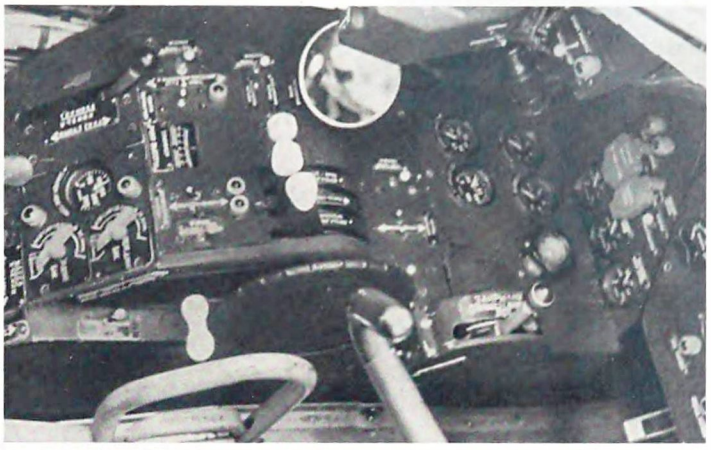
Below: The trainee's instrument panel of the IL-28U.

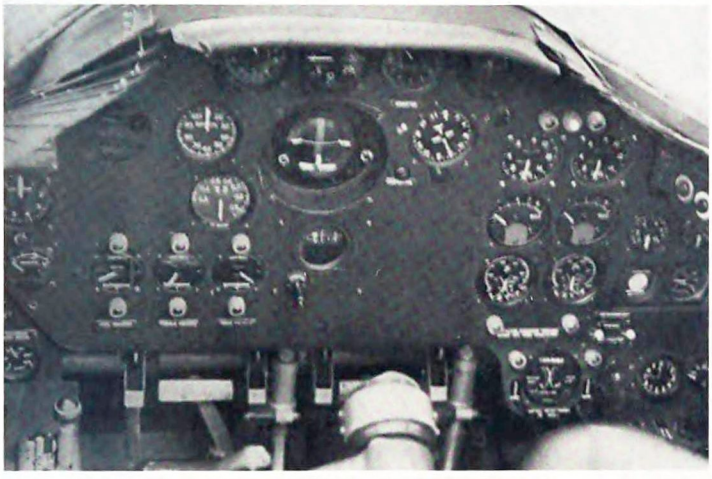
remote flux-gate compass indicator, KI-11 induction-type compass (*kompas indooktsionnyy*), NI-46 navigation display (*navigatsionnyy indikahtor*) on early aircraft, later replaced by the AB-52 navigation display, at the navigator's station showing speed, drift angle and compass deviation, KUS-1200 airspeed indicator (*kombineerovannyy ookazahtel' skorosti* – combined ASI), VD-17 barometric altimeter (*vysotomer dvookhstrelochnyy* – two-needle altimeter), RV-2 radio altimeter display, A-8 three-needle accelerometer showing the current G load and maximum positive/negative G loads experienced in a sortie, UP-2 pneumatic turn and bank indicator or EUP-46 electric turn and bank indicator (*elektricheskiy ookazahtel' povorota*), VAR-75 or VAR-30-3 vertical speed indicator (*variometr* – VSI), M-0,95 Mach meter, SD-1 DME indicator, PSP-48 two-needle heading/glideslope indicator (*pribor slepoy posahdki* – blind landing instrument), AChKhO chronometer (the navigator and gunner use AVR-M chronometers), TUE-48 cockpit and outboard air thermometers etc. The engine instruments include EMI-3 three-needle gauges (*elektricheskiy motornyy indikahtor*) showing fuel pressure, oil pressure and oil temperature, TE-15 rpm gauges (*takhometr elektricheskiy*), TGZ-47 or, from the first quarter of 1954, TVG-11 exhaust temperature gauges (*termometr vykhodyashchikh gahzov*) etc.

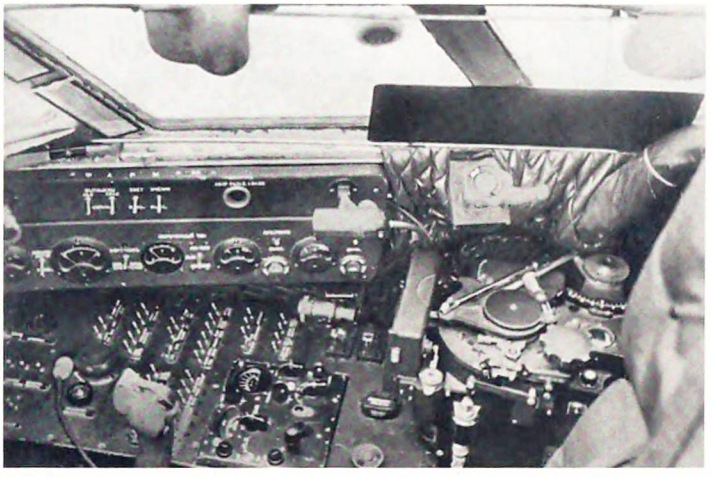


The barometric instruments receive inputs from a Type 954 main pitot on the starboard wing between ribs 32R/33R, a TP-156 pitot head (*troobka Pito*) on the port side of the nose (frames 3-4) and static ports on both sides (frames 14-15).



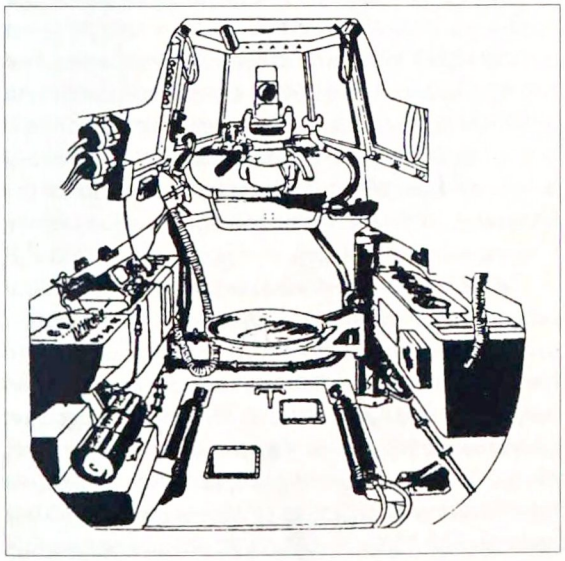


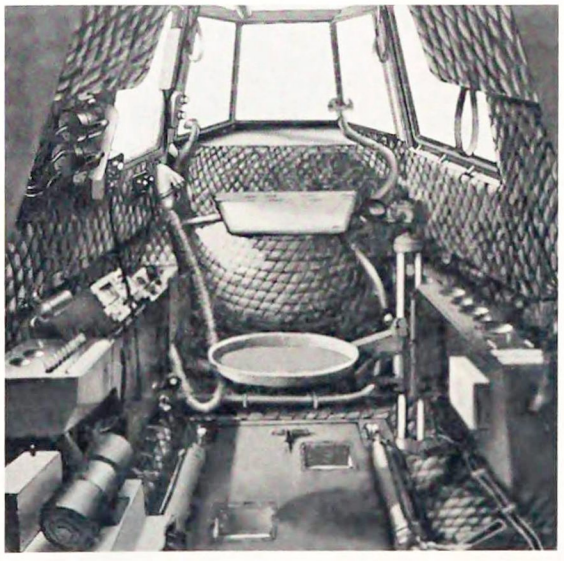




The instrument panel is manufactured in three portions stamped from MA-8 *elek**tron*** magnesium alloy sheet. The port section is rigidly bolted to fuselage frame 8, while the centre and starboard sections are attached via vibration dampers.

d) targeting equipment: The basic IL-28 *sans suffixe* has a PSBN-M 360° search radar in a ventral radome (with a control panel and a cathode-ray tube display on the port side of the navigator's station); the radar set and the revolving antenna are located at frames 12-13 and 14-15 respectively. Some IL-28s *sans suffixe* are equipped with a Rym-S rangefinding targeting system instead. Furthermore, radar-equipped aircraft have an OPB-6SR optical computing bomb sight (at frame 1) linked to the radar and the autopilot's yaw stabiliser (substituted by the OPB-5S or OPB-5SN on aircraft with





Top left: The instructor's cockpit of an IL-28U.

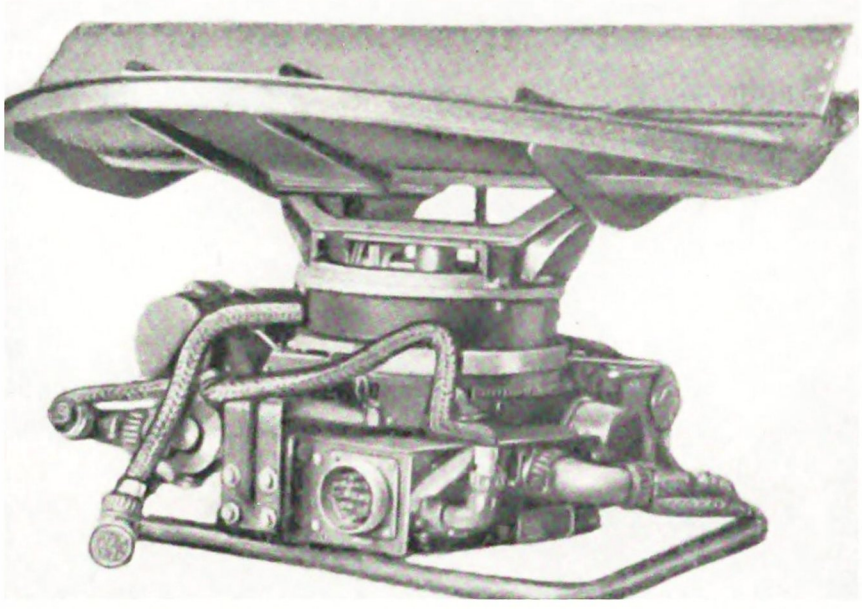
Top: The port cockpit console of the instructor's cockpit, showing the throttles and the elevator trim handwheel.

Above left: The instructor's instrument panel.

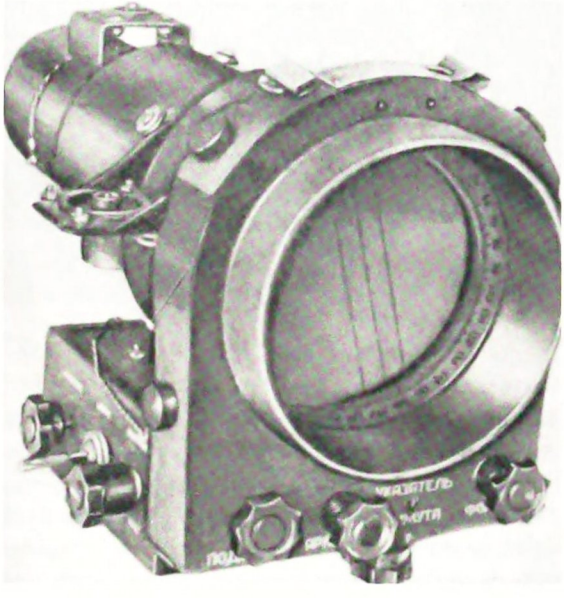
Above: The starboard cockpit console of the instructor's cockpit.

Far left: The gunner's station of an IL-28 or IL-28R.

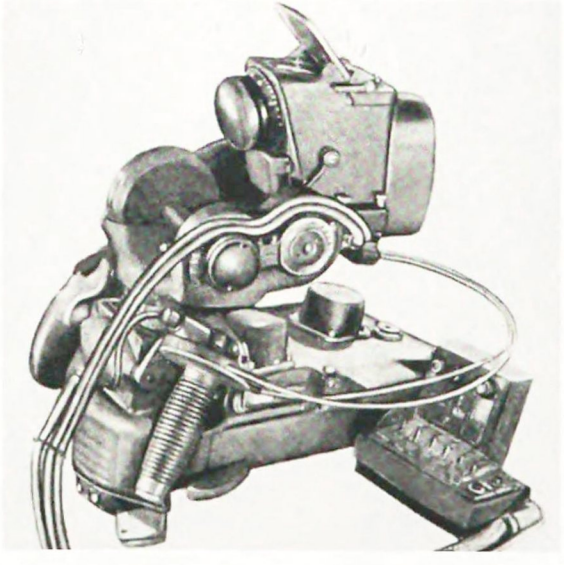
Left: The radio operator's station of an IL-28U (note the absence of the gunsight).



The revolving antenna of the PSBN-M radar (seen here upside down).



The PSBN-M's radarscope with the sunblind removed.



The gunner's ASP-3P gunsight with cannon aiming grips.

no radar), a PKI-1 fighter-type collimator gunsight for the pilot (attached to the starboard side of the windshield frame) and an ASP-3P computing gunsight for the gunner. For take-off and landing the movable bomb sight is secured by a bungee cord or (from 1953 onwards) a mechanical lock.

The IL-28R has either the same radar or a Koors radar in a much deeper teardrop radome; an NKPB-7 bomb sight is fitted for night sorties. The image on the radar display is recorded by an FRL-1M camera.

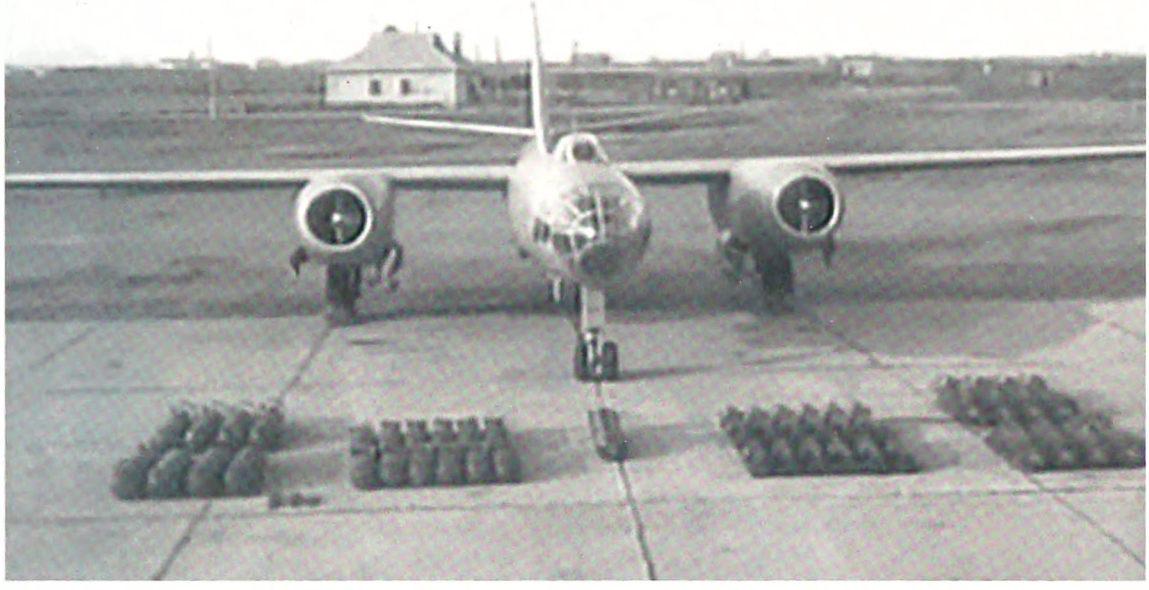
The IL-28N nuclear-capable bomber is equipped with an RBP-3 radar in a similar deep radome. The IL-28T torpedo-bomber has a different optical sight (PTN-45 or PTN-55) permitting low-altitude torpedo attacks, plus a PP-1 high-altitude sight for dropping anti-shipping mines. The IL-28U trainer is unarmed and hence lacks targeting equipment.

e) IFF equipment: Early IL-28s had a Bariy-M IFF transponder and a Magniy-M IFF interrogator in the rear avionics bay, with a ventral blade aerial. On Moscow-built aircraft from c/n 52004113 (built in 1952) onwards and on Omsk- and Voronezh-built aircraft from the first half of 1953 onwards these were replaced by an SRO transponder having a choice of four identification codes and a 'Mayday' mode; the transceiver was located in the rear avionics/equipment bay at frames 39-40 and used a ventral blade aerial (frames 40-41). Still later, it was replaced by the SRZO-2M Khrom-Nikel' combined interrogator/transponder (*samo**lyot**nyy **rah**diolokat-si**on**nyy za**pros**chik-ot**vet**chik*, or *izdeliye* 023) with triple rod aerials ahead of the nose gear unit and under the rear fuselage.

f) reconnaissance equipment: The standard bomber can be fitted with an AFA-33/75 vertical camera (f=75 cm or 50 cm) at the front end of the bomb bay between frames 18-19 for reconnaissance – or an AFA-BA camera (f=40 cm or 21 cm) for bomb damage assessment. The AFA-33 gives 190-195 30 x 30 cm (11 13/16 x 11 13/16 in) exposures and can be installed with the optical axis tilted aft 10°, 20° or 25°; for reasons of space it is not fitted when a 1,000- or 3,000-kg bomb, two 500-kg bombs or four 250-kg bombs are carried. An AFA-BA oblique camera with a window on the port side of the rear fuselage is housed in the rear avionics bay between frames 39-40; it is installed at 8° or 30° to the horizontal plane (f=21 cm) and at 15° or 30° to the horizontal plane (f=40 cm).

The IL-28T is fitted with two AFA-BA/40 vertical cameras and an AKS-1 cine camera for BDA.

The IL-28R can be fitted with several camera suites. For daylight high/medium-altitude photography the options are two AFA-33/100 or AFA-33/75 cameras on AKAFU tilting mounts in the forward and centre parts of the bomb bay, one AFA-33/20 or AFA-42/20 (AFA-RB/20) vertical camera at the rear of the bomb bay and one AFA-33/50 or AFA-33/75 oblique camera in a



An IL-28 at GK NII VVS with various bomb load options (typically eight 250-kg bombs or twelve 100-kg bombs) arrayed in front.

special camera bay in the rear fuselage with a camera port closed by a sliding door on the port side. Alternatively, two AFA-42/100 or AFA-42/75 cameras can be fitted on the forward AKAFU mount. Another possible configuration is three AFA-33s, one AFA-75MK vertical camera and one AFA-BA-40 oblique camera.

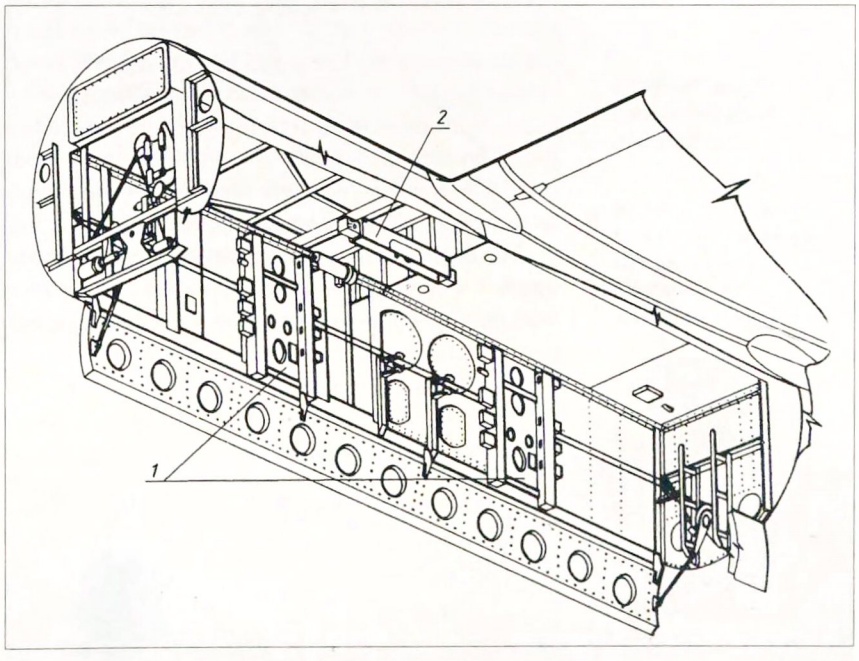
For night missions the IL-28R is configured with either two NAFA-3S/50 cameras or one NAFA-MK-75 (or NAFA-MK-50) camera, plus twelve 50-kg (110-lb) FotAB-50-35 flash bombs or 100-kg (220-lb) FotAB-100-60 flash bombs, SAB-100-55 or SAB-100-35 flare bombs. Six bombs are carried if a long-range fuel tank is fitted.

g) ECM equipment: The IL-28R is equipped with an ASO-2B chaff dispenser for passive ECM and a Natriy jammer for active ECM.

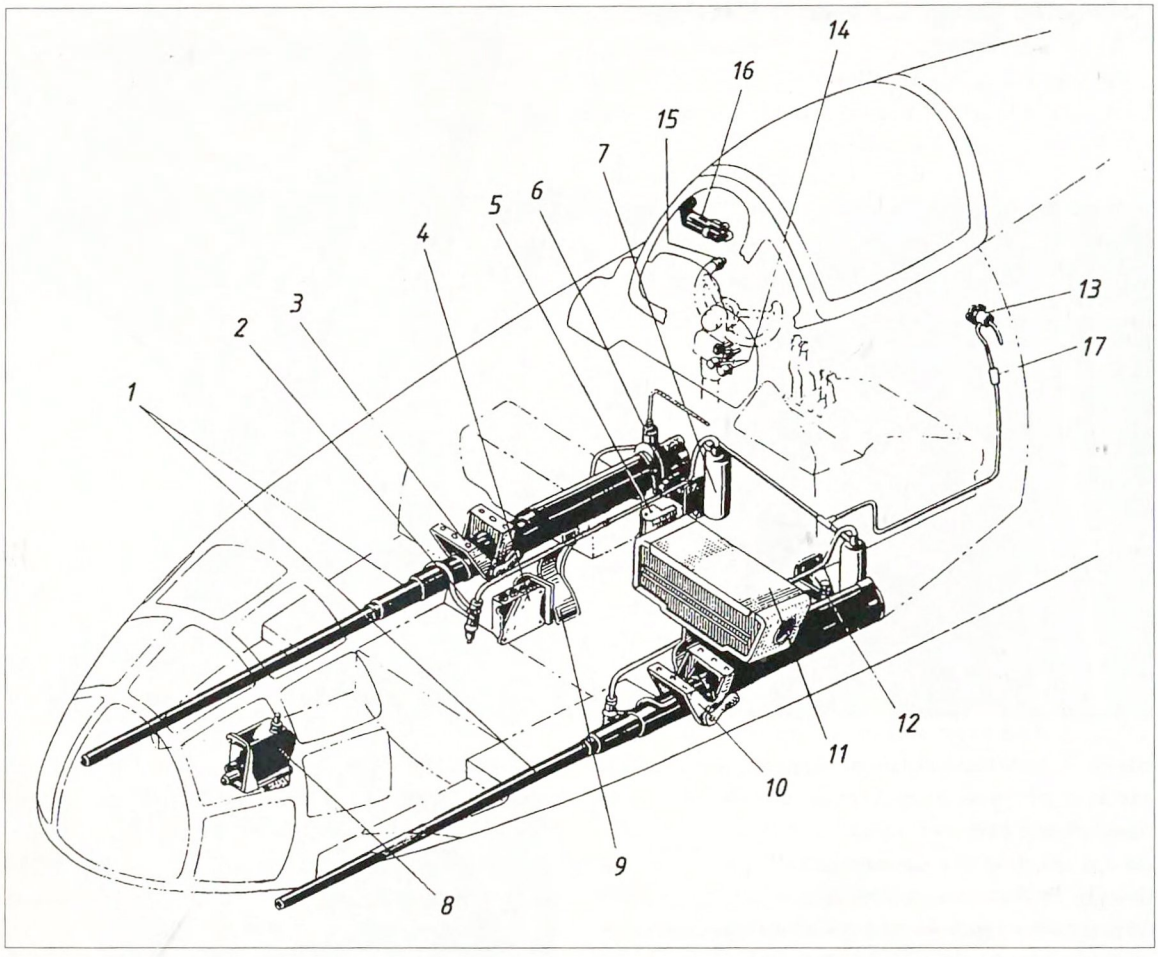
Armament: The offensive armament of the basic IL-28 *sans suffixe* comprises a normal bomb load of 1,000 kg (2,204 lb); the maximum bomb load is 3,000 kg (6,613 lb). All bombs are carried internally.

Possible bomb load options include 12 FAB-100 HE bombs, or eight FAB-250s, or four FAB-500s – all on KD3 bomb cassettes (*kas**set**nyy der**zhah**tel'* – cassette-type rack, Group 3, i.e., for ordnance up to 500 kg/1,102 lb calibre) with Der3-48B (or Der-3-54) bomb shackles on the bomb bay sidewalls; the front and rear pairs are located between frames 20-21 and 25-26 respectively. The arrangement of FAB-500M-46 bombs on the cassettes is 'front lower right/rear lower left' if two bombs are carried, and ditto plus 'front upper left/rear upper right' if four bombs are carried. Only two FAB-500s of older models can be fitted ('front upper left/front lower right') because of their longer fins. If four FAB-250M-46 bombs are carried, these are on the lower shackles. If ten FAB-100s are carried instead of the maximum of twelve, the arrangement is 'three to the left/two to the right') for the forward cassettes and vice versa for the rear ones, one of the topmost shackles remaining empty.

Alternatively, a single FAB-1500 or FAB-3000 bomb on a BD4 centreline rack (***bah**lochnyy der**zhah**tel'* – beam-type rack, Group 4, i.e., for ordnance up to 3,000 kg/6,610 lb calibre) located between frames 21-23, with a Der4-47B shackle. In this case the bomb cassettes are tilted up to the bomb bay roof.

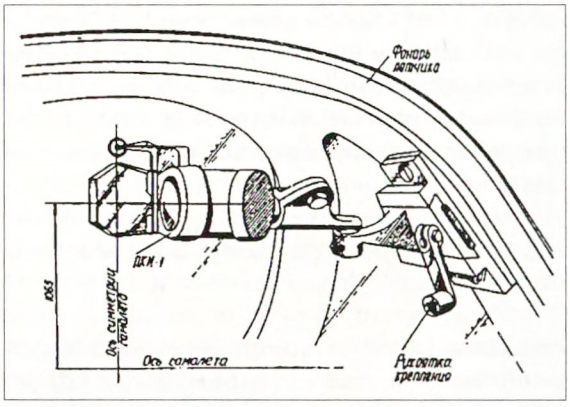


A drawing of the IL-28's bomb bay from the structural manual showing the starboard KD3 bomb cassettes (1) and the BD4 bomb rack (2).



The forward-firing cannon installation.
1. NR-23 cannons
2. EK-48 reloading valve
3. Starboard cannon forward attachment point
4. AP-5 reloading device with spark suppressor
5. K-100D relay
6. Starboard cannon rear attachment point
7. Expansion tank
8. Gun camera
9. Spent case deflector
10. Port cannon forward attachment point
11. Port ammunition box
12. Port cannon rear attachment point
13. Reloading cock
14. Reloading buttons
15. Fire control button
16. PKI-1 gunsight
17. Check valve

The bombs can be dropped singly, in series of one, two or four, or in a salvo; the bombs' fuses can be set for detonation or (in an emergency) non-detonation by an MVN-48 selector (*mekha**nizm** "**vzryv**-ne**vzryz**"* – 'explosion/non-explosion mechanism'). On early production aircraft this was done by means of an ESBR-45 primary electric bomb release mechanism (*e**lek**tro**sbrah**syvatel'*) or a KVSB-48 emergency bomb release mechanism (*ko**rob**ka vari**ahn**tov **sbro**sa bomb* – bomb drop option selector box); these were replaced by the ESBR-49M and KVSB-48A on IL-28s built from mid-1954 onwards. A safety feature prevents bomb release when the bomb bay doors are closed.

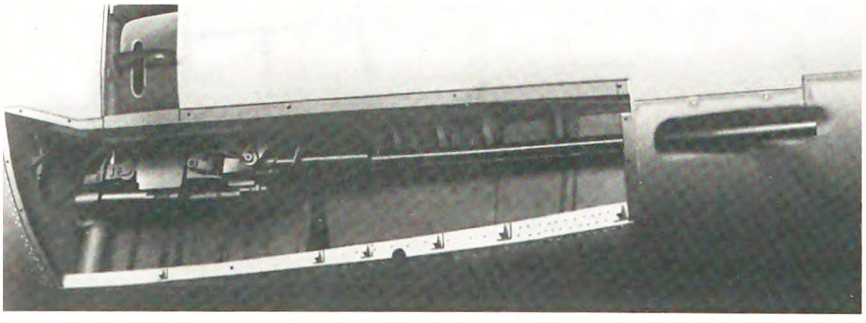


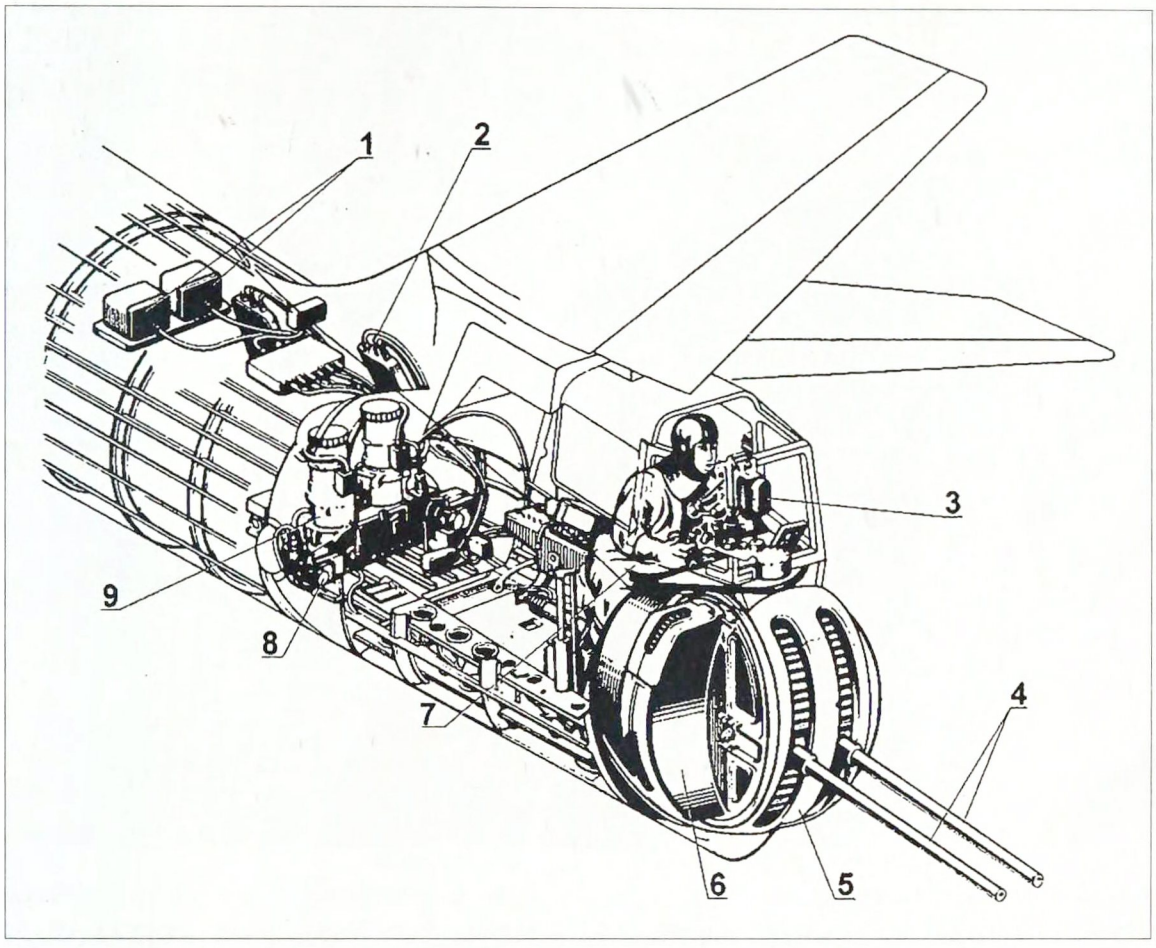
Right: The PKI-1 gunsight as seen by the pilot.

The bomb release sequence depends on the type of bombs for CG reasons. For 500-kg bombs it is rear left – front right – rear right – front left. For eight 250-kg bombs it is rear lower left – front lower right – rear lower right – front lower left – rear upper right – front upper left – rear upper right – front upper left. With twelve 100-kg bombs the sequence is even more complex: rear lower left – front lower right – rear lower right – front lower left – rear upper right – front upper left – rear upper right – front upper left – rear centre right – front centre left – rear upper right – front upper left – rear centre left – front centre right – rear upper left – front upper right.

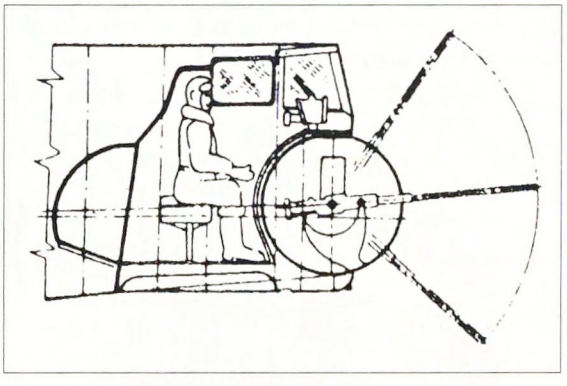
Bomb loading/unloading is performed by means of BL-47 manually operated bomb hoists (***bom**bovaya le**byod**ka*) fitted to the rear fuselage between frames 33-34 and a system of cables and pulleys on the bomb

Below: The starboard forward-firing NR-23 cannon and its ammunition box with access panels removed.

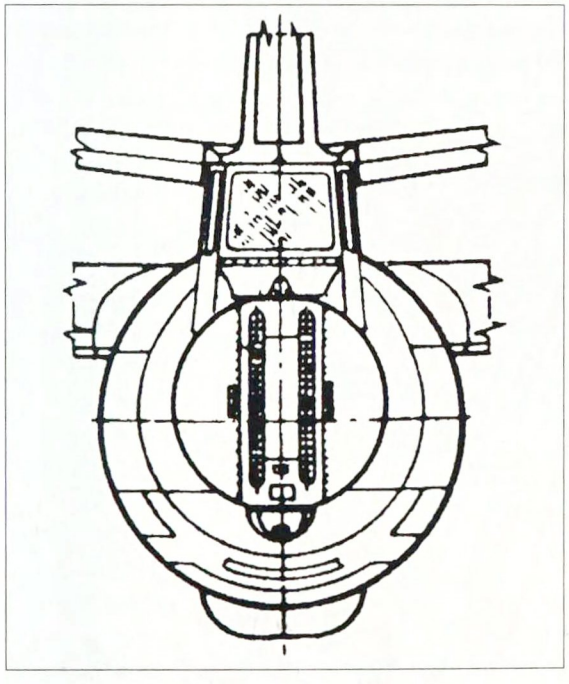




The tail cannon installation.
1. Amplifiers
2. Electric equipment
3. ASP-3P sighting station
4. NR-23 cannons
5. IL-KU6 turret
6. Ammunition box
7. Gunner's seat
8. RUP-3 pump
9. AKP-4 tilting pump module



A schematic drawing of the gunner's station. The bulge at the front is for accommodating certain avionics items which are not shown here.



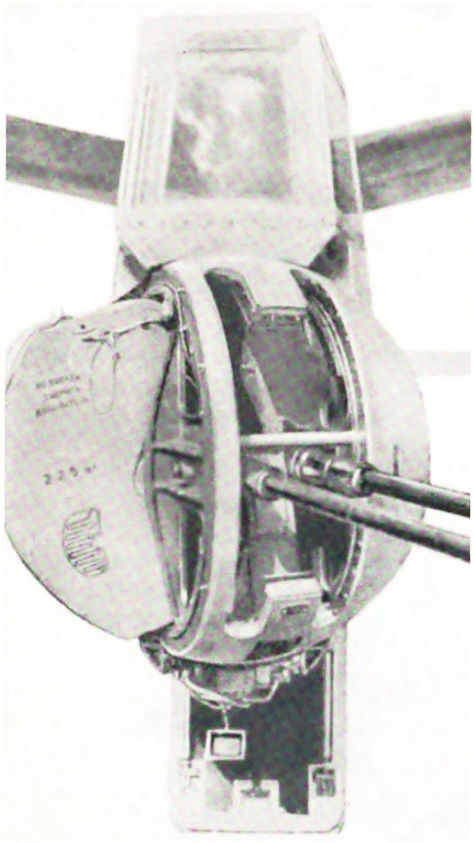
Rear view of the gunner's station and IL-KU6 turret.

bay walls. Fixed and detachable bomb guides are used when bombs are carried on the centreline BD4 rack to keep the bomb from swaying.

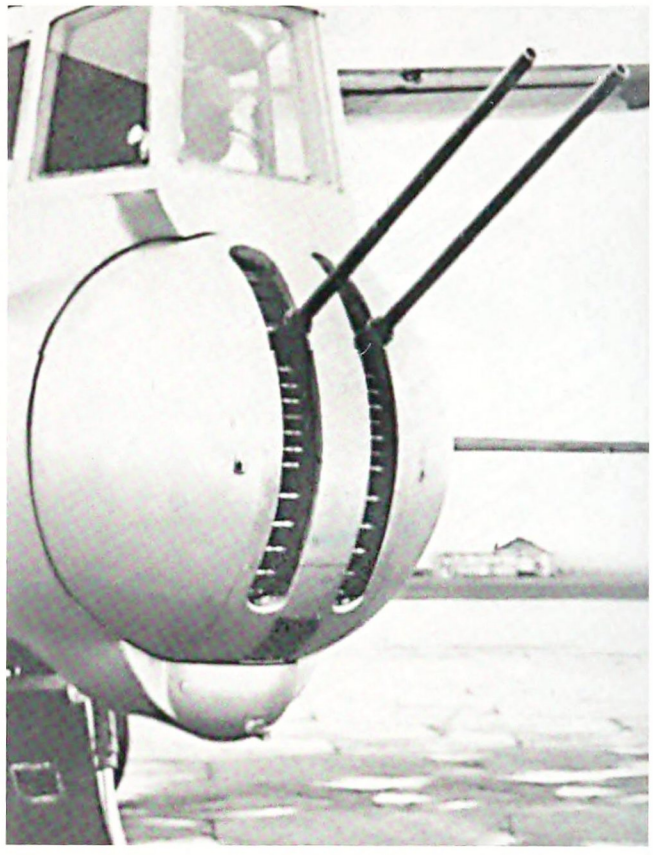
The navigator's station is provided with indicator lights for the open and closed positions of the bomb bay doors. A special circuit breaker allows the bombs to be set for detonation or non-detonation (in the event of emergency jettisoning); both modes have indicator lights on the pilot's port cockpit console.

The IL-28T torpedo-bomber in its operational form can carry a single RAT-52 rocket-propelled torpedo internally and one or two naval mines (AMD-4-500, AMD-4-1000, AMD-M or Type A). The ordnance loads are the same as for the basic bomber. The IL-28N is optimised for carrying an RDS-4 tactical nuclear bomb.

The IL-28Sh has six hardpoints under each wing at ribs 4, 12, 14, 16, 18 and 20 with BD3-U pylons allowing 12 UB-16-57 rocket pods with a total of 192 57-mm (2.24-in) S-5 FFARs to be carried.



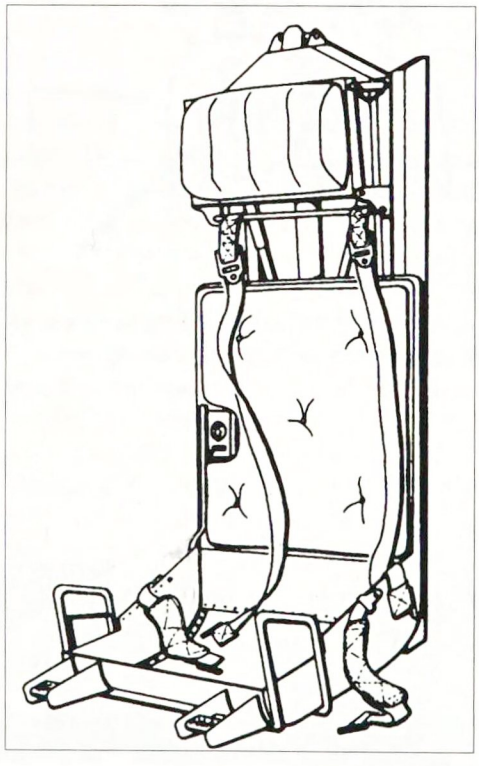
Right: The IL-KU6 turret with the port half of the cowling detached and the port ammunition box swung out for loading. Note the open gunner's entry hatch.

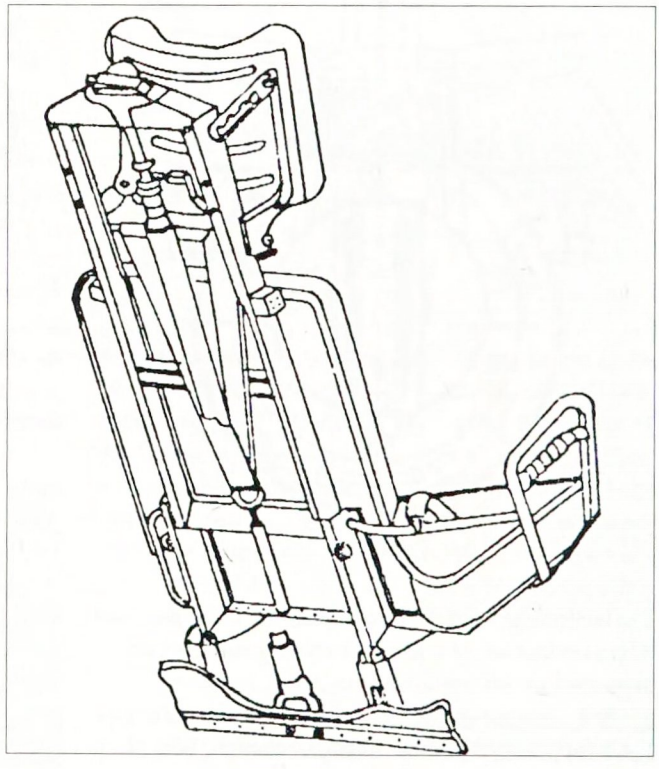


Far right: The IL-KU6 with the cannons raised, as they normally are.

Alternatively, six 230-mm (9.05-in) S-24 heavy unguided rockets can be carried. Some sources claim the IL-28Sh can also carry UPK-23-250 cannon pods, each having a 23-mm (.90 calibre) GSh-23 double-barrel cannon with 250 rounds.

The *defensive armament* of the IL-28 *sans suffixe* comprises four 23-mm Nudelman/Rikhter NR-23 (*izdeliye* 150P) cannons. Two of them with 100 rpg are rigidly mounted in the nose on front and rear mounts between frames 2-8, 1,080 mm (3 ft 6$^{3}/_{64}$ in) apart, and





Two views of the cartridge-fired ejection seat used on the IL-28, showing the dished seat pan, the firing handle on the right-hand grip, the harness, the adjustable headrest and the ejection gun.

Specifications of some IL-28 versions

	IL-28	IL-28U	IL-28R	IL-28T
Overall length	18.0 m (59 ft 0²⁵⁄₃₂ in)	18.0 m (59 ft 0²⁵⁄₃₂ in)	18.0 m (59 ft 0²⁵⁄₃₂ in)	18.0 m (59 ft 0²⁵⁄₃₂ in)
Fuselage length	17.65 m (57 ft 10⅞ in)	17.65 m (57 ft 10⅞ in)	17.65 m (57 ft 10⅞ in)	17.65 m (57 ft 10⅞ in)
Wing span	21.45 m (70 ft 4³¹⁄₆₄ in)	21.45 m (70 ft 4³¹⁄₆₄ in)	21.65 m (71 ft 0²³⁄₆₄ in) [1]	21.45 m (70 ft 4³¹⁄₆₄ in)
Stabiliser span	7.36 m (24 ft 1⁴⁹⁄₆₄ in)	7.36 m (24 ft 1⁴⁹⁄₆₄ in)	7.36 m (24 ft 1⁴⁹⁄₆₄ in)	7.36 m (24 ft 1⁴⁹⁄₆₄ in)
Height on ground	6.0 m (19 ft 8³⁄₃₂ in) [2]	6.0 m (19 ft 8³⁄₃₂ in) [2]	6.0 m (19 ft 8³⁄₃₂ in) [2]	6.0 m (19 ft 8³⁄₃₂ in) [2]
Landing gear track	7.4 m (24 ft 3¹³⁄₆₄ in)	7.4 m (24 ft 3¹³⁄₆₄ in)	7.4 m (24 ft 3¹³⁄₆₄ in)	7.4 m (24 ft 3¹³⁄₆₄ in)
Landing gear wheelbase	6.677 m (21 ft 10¹³⁄₁₆ in)	6.677 m (21 ft 10¹³⁄₁₆ in)	6.677 m (21 ft 10¹³⁄₁₆ in)	6.677 m (21 ft 10¹³⁄₁₆ in)
Wing area, m² (sq. ft)	60.8 (653.76)	60.8 (653.76)	60.8 (653.76)	60.8 (653.76)
Total aileron area, m² (sq. ft)	3.34 (35.95)	3.34 (35.95)	3.34 (35.95)	3.34 (35.95)
Aileron trim tab area, m² (sq. ft)	0.727 (0.78)	0.727 (0.78)	0.727 (0.78)	0.727 (0.78)
Total flap area, m² (sq. ft)	7.45 (80.19)	7.45 (80.19)	7.45 (80.19)	7.45 (80.19)
Horizontal tail area, m² (sq. ft)	10.82 (116.34)	10.82 (116.34)	10.82 (116.34)	10.82 (116.34)
Vertical tail area, m² (sq. ft)	7.8 (83.87)	7.8 (83.87)	7.8 (83.87)	7.8 (83.87)
Empty operating weight, kg (lb)	12,890 (28,420)	11,740 (25,880)	13,518 (29,801)	13,370 (29,475)
Take-off weight, kg (lb):				
normal	18,400 (40,560)	17,525 (38,635)	19,500 (42,900)	18,760 (41,360)
maximum	21,000 (46,300)	-	22,720 (50,090)	21,620 (47,660)
in overload condition	23,200 (51,140)	–	n.a.	n.a.
Maximum landing weight, kg (lb)	14,750 (32,520)	n.a.	n.a.	n.a.
Bomb load, kg (lb):				
normal	1,000 (2,204)	–	–	1,000 (2,204)
maximum	3,000 (6,612)	–	–	3,000 (6,612)
Fuel load, kg (lb):				
normal	n.a.	n.a.	n.a.	3,800 (8,380)
maximum	6,600 (14,550)	5,480 (12,080)	8,822 (19,448)	6,475 (14,275)
Maximum speed, km/h (mph):				
at sea level	800 (496)	n.a.	n.a.	800 (496)
at 5,000 m (16,400 ft)	902 (560) [3]	895 (555)	876 (544)	877 (544.7)
at 10,000 m (32,810 ft)	855 (531)	n.a.	n.a.	n.a.
Rotation speed, km/h (mph)	160 (99)	n.a.	195 (121)	n.a.
Unstick speed, km/h (mph):				
with a 18,400-kg TOW	235 (146)	n.a.	245 (152)	n.a.
with a 23,200-kg TOW	260 (161)	–	–	–
Landing speed, km/h (mph)	178 (110.5)	185 (115)	n.a.	177 (110)
Rate of climb at sea level, m/sec (ft/min)	15 (2,950)	17 (3,345)	n.a.	13.4 (2,637)
Service ceiling, m (ft):				
with a 18,400-kg TOW	12,500 (41,010)	12,300 (40,350)	12,300 (40,350)	11,900 (39,040)
with a 23,200-kg TOW	10,750 (35,270)	–	–	–
Time to height, minutes:				
to 5,000 m (16,400 ft)	6.5 [4]	5.5	n.a.	7.1
to 10,000 m	18.0 [4]	n.a.	n.a.	n.a.
to 12,500 m (41,010 ft)	31.0 [4]	–	41	–
Time to service ceiling, minutes:				
with a 18,400-kg TOW	40.7	40.7	40.7	40.7
with a 23,200-kg TOW	45.4	45.4	45.4	45.4
Range, km (miles):				
with a 1,000-kg bomb load	2,260 (1,403)	2,400 (1,490)	n.a.	2,000 (1,242) [6]
maximum	2,410 (1,496) [5]	n.a.	3,040 (1,888) [1]	2,149 (1,334)
Endurance	3 hrs 7 min [7]	n.a.	n.a.	n.a.

Take-off run with normal TOW, m (ft):				
concrete strip	875 (2,870) [8]	780 (2,560)	650 (2,130) [10]	1,395 (4,580)
dirt strip	1,290 (4,230) [9]	n.a.	n.a.	n.a.
Take-off run with overload TOW, m (ft):				
concrete strip	1,720 (5,640) [11]	n.a.	1,500/890 (4,920/2,920) [12]	n.a.
dirt strip	2,350 (7,710) [11]	n.a.	n.a.	n.a.
Landing run, m (ft)	1,170 (3,840)	825 (2,710)	1,620 (5,315)	940 (3,080)
CG range, % MAC:				
permissible	15-24	n.a.	15-24	n.a.
recommended	19-21	n.a.	20-21	n.a.

Notes:

1. With tip tanks; 2. Also quoted as 6.2 m (20 ft 4 15/16 in) and even as 6.7 m (21 ft 11 49/64 in); 3. At 4,500 m (14,760 ft);
4 With a 18,400-kg (40,560-lb) TOW; 5 Quoted as 1,930 km (1,198 miles) with a 20,750-kg (45,740-lb) TOW and cruising at 9,700-11,500 m (31,820-37,730 ft);
6. With one 1,073-kg (2,365-lb) torpedo; 7. With a 20,750-kg TOW and cruising at 9,700-11,500 m; 8. Unstick speed 220 km/h (136 mph); 9. Unstick speed 235 km/h (146 mph);
10. Unstick speed 259 km/h (160 mph); 11. Unstick speed 260 km/h (161 mph); 12. Without/with JATO boosters.

secured by quick-release locks at the rear. Their ammunition boxes are located outside the pressurised cockpit between frames 7-8; the routing of the ammunition belts was changed twice (from Moscow-built c/n 50301301 onwards and from Moscow-built c/n 52004201, Voronezh-built c/n 2402001 and Omsk-built c/n 26602801 onwards). The firing button is located on the right-hand horn of the control wheel. Spent cases and belt links are collected in special bays.

The other two cannons with 225 rpg were initially installed in an IL-K6 electrohydraulically-powered remote-controlled 'ball' turret housed in the tail section and operated by the gunner; this was progressively replaced in production by the IL-K6-51 (IL-K6M) and IL-K6-53 versions. The tail turret's field of fire is ±70° in azimuth and +60°/–40° in elevation. Minimum traversing and elevating speed is 0.25°/sec; normal traversing and elevating speeds are at least 17°/sec and 14°/sec respectively, while maximum traversing and elevating speeds are at least 36°/sec and 28°/sec respectively. The ammunition boxes are housed inside the turret. Weight without cannons and ammunition is 375 kg (826 lb) for the IL-K6-51 and 346 kg (762 lb) for the IL-K6-53; with cannons and ammunition it is 630 and 601 kg (1,389 and 1,325 lb) respectively.

The NR-23 weighs 39 kg (86 lb). It is belt-fed and fires 200-gram (7.06-oz.) projectiles (the complete rounds weigh 340 g/12 oz.), using BZT-23 (*bronebo**y**no-zazhi**gah**tel'no-tras**see**ruyushchiy* – armour-piercing/incendiary/traced, API-T) and OZT-23 (*os**kol**ochno-zazhi**gah**tel'no-tras**see**ruyushchiy* – fragmentation/incendiary/traced, FI-T) rounds. The rate of fire is 800-950 rounds per minute and muzzle velocity is 680 m/sec (2,231 ft/sec). Spent cases and belt links are ejected. The cannons are electrically controlled and electropneumatically cocked by AP-5 mechanisms (*avto**maht** pereza**ryad**ki* – automatic reloading device), using the main pneumatic system. The rounds are counted by USB-1 counters (one for each cannon).

The IL-28R and IL-28T have three cannons, the starboard forward-firing cannon being deleted. The IL-28U, IL-20 and IL-28ZA lack armament.

Gunnery results are recorded by two S-13 gun cameras installed on the port side of the navigator's station glazing and on the tail turret. Aircraft equipped with the IL-K6-53 tail turret have an FKP-2-2 rear gun camera (***foto**kin**opoole**myot*** – lit. 'photo/cine machine gun') fitted instead.

Rescue equipment: The crew are provided with PLK-45 or MPLK-49 seat-type parachutes (some documents say S-2-3 or S-3-3). In an emergency, the pilot and navigator/bomb-aimer use upward-firing ejection seats developed by the Ilyushin OKB. These are non-interchangeable, differing in the seat back's reclining angle and the length of the ejection gun, which is 1.1 m (3 ft 7 19/64 in) for the pilot's seat and 1.0 m (3 ft 3 3/8 in) for the navigator's seat. Each seat has a lightweight frame attached to the seat pan, mounting the padded seat backrest and adjustable headrest.

Ejection is initiated by pulling a handle on the right-hand grip of the seat. The pilot's canopy must be jettisoned first; the jettison handle also disengages the control column, which then tilts forward, preventing injury. An AD-3 automatic device cuts the harness and opens the parachute 2.5 seconds after ejection. The tail gunner/radio operator bails out downwards via the entrance hatch; the hatch cover is actuated by twin pneumatic rams, doubling as a slipstream deflector, and two handles have to be used to depressurise the compartment and set the hatch to emergency mode.

Three first-aid kits are provided in both pressure cabins.

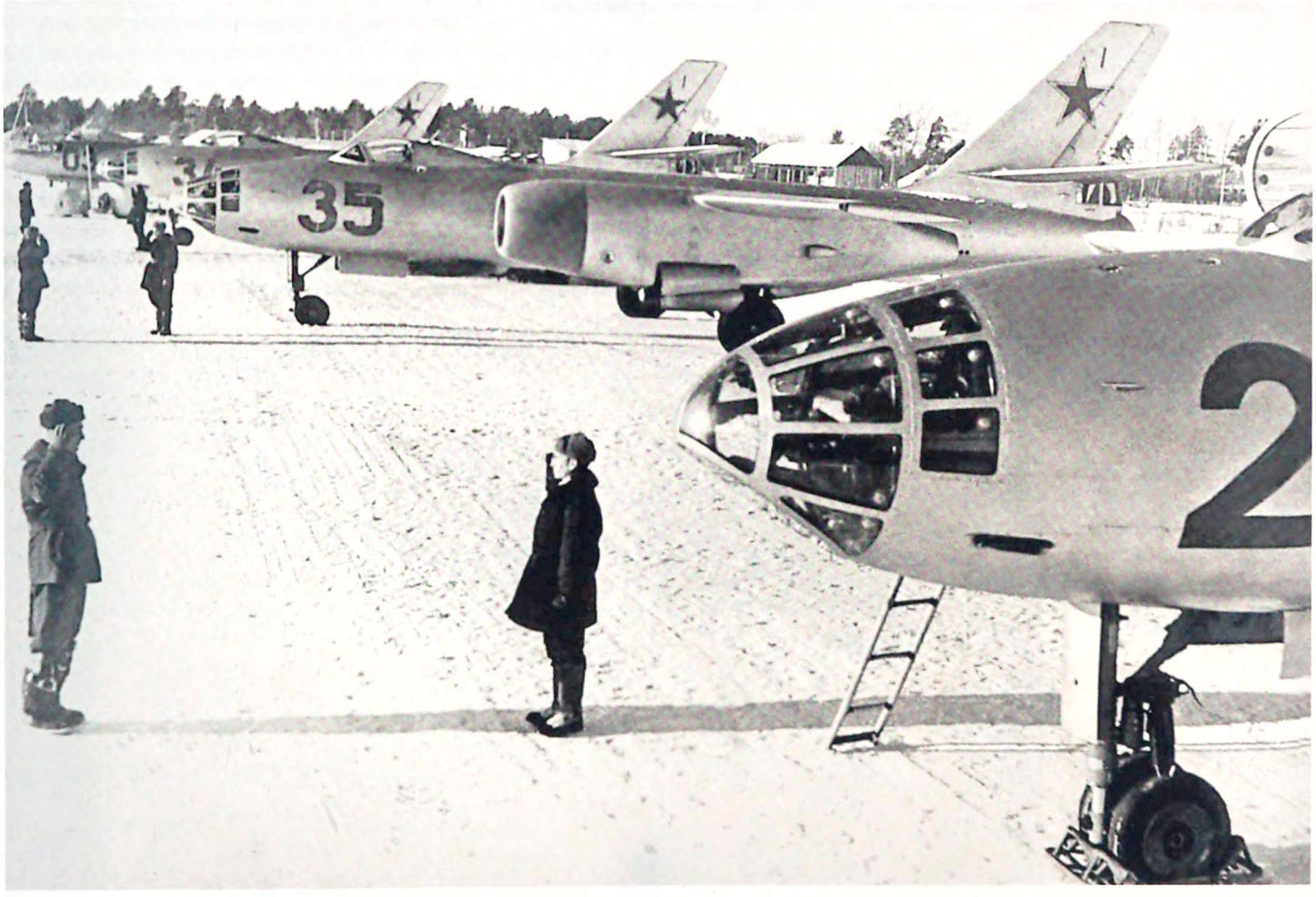
IL-28T torpedo-bombers carried an LAS-3 three-man inflatable rescue dinghy; it was also carried by reconnaissance aircraft and bombers on overwater missions.

CHAPTER SIX

The *Beagle* in service

The advent of the IL-28 signified the beginning of the jet age for the Soviet tactical bomber force. As already mentioned, the 45th BAP of the 56th *Breslavskaya* TBAD, Moscow Military District, was the first to take delivery of the new bomber in 1950. The regiment, which was then equipped with Douglas A-20B Boston bombers and commanded by Lt.-Col. Anatoliy A. Anpilov (Hero of the Soviet Union), was based at Migalovo AB near Kalinin (not to be confused with Kaliningrad; the city has now been renamed back to Tver'). The division had earned its honorary appellation for its part in the siege and taking of the German city of Breslau (now Wrocław, Poland) in February-May 1945 as part of the Lower Silesian Offensive.

The availability of the IL-28U prototype borrowed from the Ilyushin OKB facilitated conversion training no end; 27 service pilots transitioned from the Tu-2 to the IL-28 in just ten days during which 112 training flights were made. This allowed the 244th BAP to master the type in time for that year's May Day parade in Moscow's Red Square –



A typical publicity shot of a group of IL-28s preparing for a training session at a wintry airbase, with an IL-28U at the far end of the flight line. Note the red-painted cowlings on the second aircraft in the row and the silica gel cartridges in the double glazing panels.

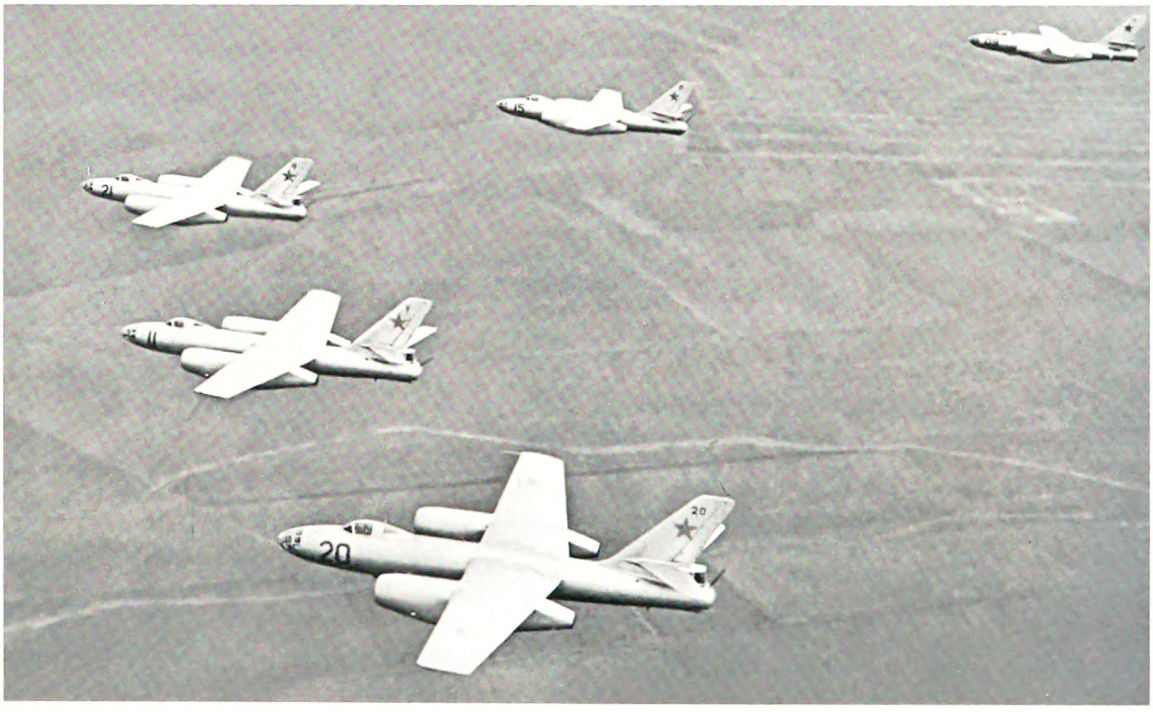
Anatoliy A. Anpilov (shown here as Major-General) was the commander of the first Air Force division to operate the IL-28.

an all-important show of force in which the unit participated in full regiment strength.

As mentioned in the preceding chapter, in 1950 the Air Force took delivery of 164 IL-28s, making it possible to begin re-equipping to tactical bomber units *en masse*. Yet the military considered the delivery rate to be sorely inadequate, and with good reason. In a report to Iosif V. Stalin in April 1951 the Air Force Commander-in-Chief Col.-Gen. Pavel F. Zhigarev stated that 21 bomber regiments and 18 reconnaissance air regiments of the Tactical Aviation were still largely equipped with wartime Petlyakov Pe-2 *Buck* dive-bombers and Douglas A-20 Boston bombers which accounted for 65% of the fleet. These were not only obsolete but also worn out, with a consequent deterioration in flight performance. For example, the Pe-2's Klimov M-105PF engines were delivering some 200 hp less power than when new; as a result, the service ceiling dropped from 8,200 to 5,000 m (from 26,900 to 16,400 ft), the bomb load was reduced to a ridiculous 300-400 kg (660-880 lb) and dive-bombing was prohibited, rendering the aircraft useless as a bomber. The more modern A-20s had been delivered under the Lend-Lease Agreement; no spares for the aircraft itself or its Wright R-2600 Twin Cyclone engines could be procured any more, making repairs impossible and causing many A-20s to be cannibalised. Also, the overall number of bombers was 3,110 instead of the required 3,648, of which 2,020 were obsolete wartime aircraft.

Zhigarev wrote: *'The existing situation requires urgent and effective measures to ensure renewal of the tactical bomber fleet. It is imperative that all Pe-2s and Bostons currently in service with the tactical bomber divisions and reconnaissance air regiments be replaced with IL-28s in the next two years. According to the production plan for 1951, the Ministry of Aircraft Industry's plants are to manufacture only 350 IL-28 tactical bombers. In 1952 MAP plans to manufacture only 350-400 IL-28s. At this rate of [...] IL-28 production the Tactical Aviation's completely worn out [...] Pe-2s and Bostons can only be replaced in seven or eight years. This situation is insupportable.'* Indeed, many of the 'war weary' aircraft simply would not last that long.

A group of IL-28s cruises in V formation over typically flat East European countryside during an exercise.



Zhigarev went on: *'In order to accelerate the re-equipment of the tactical bomber divisions and reconnaissance air regiments, I consider it necessary to request that you require the Ministry of Aircraft Industry (Comrade [Mikhail V.] Khroonichev) to:*

1. Increase the planned figures of IL-28 tactical bomber production for 1951 by 150 aircraft over the stipulated 350. We believe that MAP is able to cope with such a task.

2. Allocate manufacturing facilities in order to further increase [...] IL-28 production to at least 700 aircraft in 1952 and 1,000 aircraft in 1953.

At this production rate the tactical bomber divisions and the Naval Ministry's reconnaissance air regiments will be able to re-equip with jet aircraft within two or three years.'

The report served its purpose – in fact, the aircraft industry did even better than that.

Flaps fully deployed, an IL-28 coded '07 Red' comes in to land.

In defence of peace and socialism, or Cold War warriors

By the mid-1950s the Tactical Aviation had largely completed its transition to the IL-28. Of course, the units and formations stationed in the western military districts of the USSR, which were closest to the potential adversary, were the first to receive the jets. This included the bomber divisions headquartered at Chernyakhovsk (Baltic MD), Starokonstantinov and Stryy (Carpathian MD), Limanskoye (Odessa MD) etc. Each division included two or three bomber regiments comprising three squadrons each; each squadron had ten bombers (three flights of three plus a reserve aircraft) and one or two IL-28U trainers. For instance, the 32nd BAD headquartered at Starokonstantinov (Khmel'nitskiy Region) included the co-located 7th FBAP (*frontovoy bombardirovochnyy aviapolk* – Tactical Bomber Regiment). The 56th BAD, which fully converted to the IL-28 by May 1952, was then headquartered at Migalovo AB, comprising the 45th, 173rd and 224th BAPs.

The 63rd BAD of the 57th VA (*vozdooshnaya armiya* – air army) headquartered at Stryy (L'vov Region, western Ukraine) included the 230th FBAP at Cherlyany AB a short way west of L'vov and the 408th *Allenshtainskiy* FBAP, which is variously reported as based at Stryy or at Cherlyany. The latter regiment had received its honorary appellation for its part in the taking of Allenstein, Eastern Prussia (now Olsztyn, Poland). In the 83rd BAD headquartered at Komsomol'sk-on-Amur (Far Eastern MD), the IL-28 saw service with the 277th *Mlavskiy* BAP at Komsomol'sk-on-Amur/Khoorba airport. The unit had earned the honorary appellation for its part in liberating the Polish town of Mława in 1944.

Maintenance day at an IL-28 unit. The second aircraft in the row, '12 Blue' (c/n 3402209), is having its tail cannons cleaned. Note that the farthest aircraft in the row lacks tail cannons and is most probably an IL-28U. Ground power is provided both by a towed battery cart and by a self-propelled GPU.

The 132nd *Sevas**top**ol'skaya* BAD headquartered at Chernyakhovsk (in the Kaliningrad Region exclave) consisted of three regiments, including the co-located 4th *Novgo**rod**skiy* GvBAP (*Gvar**dey**skiy bombardi**rov**ochnyy **avia**polk* – Guards Bomber Regiment). The division and the regiment had received these honorary appellations in the Great Patriotic War for their part in the liberation of Sevastopol' on the Black Sea coast and Novgorod in north-western Russia. (The latter city was renamed back to Velikiy Novgorod – 'Great Novgorod' – to discern it from Nizhniy Novgorod, 'Lower Novgorod', which is 'down southeast'.)

In the Belorussian MD, the type was operated by the 157th BAD comprising the 993rd and 998th BAPs, both stationed at Shchoochin (Grodno Region) from 1953 and equipped with nuclear-capable IL-28Ns. Additionally, a flight of 157th BAD bombers was deployed full time at Machoolishchi AB just south of Minsk. Later, a second division equipped with IL-28Ns – the 187th BAD – was formed at Shchoochin. Subsequently, when the 166th BAD equipped with IL-28s moved from East Germany to the Soviet Union (see 'Foreign deployments' section below), the nuclear-capable bombers were dispersed among the units of the 26th VA, and the 157th BAD re-equipped with ordinary (conventional) *Beagles*.

The 164th GvBAD (*Gvar**dey**skaya bombardi**rov**och-naya **avia**di**vee**ziya* – Guards bomber division), which was then under the control of the Tavrida MD (this Military District comprising the Crimea and Kherson Regions was absorbed into the Odessa MD in April 1956), included the 654th GvBAP and 748th GvBAP based at Zaporozhye-Mokraya AB and the 819th GvBAP at Melitopol' (later Zaporozh'ye), all flying IL-28s. (The division was previously based in Hungary – see below.) The 819th GvBAP was transferred to the Naval Aviation in 1958. The 188th ***Rizh**skaya* BAD headquartered at Marneuli, Georgia (Transcaucasian MD), comprised the 367th BAP at Dallyar (Azerbaijan), the 373rd *Ber**lin**skiy* BAP at Kody and the 650th BAP at Marneuli (Sandar AB). The honorary appellations had been awarded for the respective units' participation in the taking of Riga in 1944 and Berlin in 1945. All three regiments converted from the Tu-2 to the IL-28 in 1953.

Other VVS units operating the IL-28 included the 114th BAP, which was established at Starokonstantinov in 1952 but moved to Domna AB in East Siberia (Chita Region, Transbaikalian MD) in 1968, and the 733rd BAP. The latter was originally part of the 57th VA/7th BAD but later also relocated to Domna.

By the spring of 1953 the first-line units of the Soviet Air Force and the Soviet Naval Aviation had mastered various versions of the IL-28 (the *Beagle*'s naval operations are described separately below). On 11th March that year Air Force Commander-in-Chief Pavel F. Zhigarev (by then promoted to Air Marshal) wrote to Nikolay A. Bulganin, who was still First Vice-Chairman of the Council of Ministers at that time (he would be appointed Minister of Defence four days later):

'The majority of the first-line units' flying personnel has a positive appraisal of the IL-28 aircraft, saying that the aircraft is easy to master for the average-skilled pilot. Its avionics enable it to operate in daytime and at night in clouds and above the clouds, delivering bomb strikes from high and medium altitudes without visual contact with the ground. From an operational reliability standpoint the IL-28 is an improvement over the aircraft types operated previously by the bomber arm of the Soviet Army Air Force.' (Yes – in similar manner to the US Army Air Force, for a while the Soviet Air Force was officially styled as the Workers' and Peasants' Red Army Air Force (VVS RKKA – *Vo**yen**no-voz**doosh**nyye **see**ly Ra**bo**che-krest'**yahn**skoy **Kras**noy **ar**mii*) and later the Soviet Army Air Force (VVS SA – *Vo**yen**no-voz**doosh**nyye **see**ly So**vet**skoy **ar**mii*). It took a while before the army reference was dropped – *Auth.*)

The IL-28 was the first Soviet tactical bomber with a radar which made it possible to take aim even if the target was obscured by cloud. It also gave the tactical bomber force nuclear capability, which was particularly welcome during the Cold War years. Once it had become fully operational – i.e., the crews learned to fly in IMC and at extreme altitudes, use the bomb-aiming equipment (the radar and synchronised optical sight) and the defensive armament effectively – Soviet tactical air power received a major boost. Service introduction was speeded up by holding workshops in which the Air Force C-in-C and other top brass participated, as did service pilots, Ilyushin OKB representatives and representatives from the factories building the bomber.

In his memo to Bulganin quoted above, Zhigarev wrote: *'On the other hand, pilots report that a number of deficiencies reducing the IL-28's value have been revealed in the course of operation'*. Of course, like any new aircraft type, the *Beagle* had its fair share of teething troubles, and these were dealt with as they came. In particular, the PSBN-M radar was a royal pain in the neck at first, since the radar set used vacuum tubes which are sensitive to vibration and G loads (not to mention the fact that Soviet electronics were notoriously unreliable). Luckily the OKB-339 engineers who created the PSBN-M had foreseen this and designed the radar as a modular system with line-replaceable units (LRUs), which eliminated the need to keep the aircraft grounded for radar repairs. This ultimately was one of the factors of the *Beagle*'s high combat readiness.

During operations in rainy weather a film of water formed on the cockpit windshield, impairing visibility (especially on landing approach); it was even worse in snowy weather when a crust of ice built up on the canopy. In cold weather the glazing tended to mist up and then ice up for an extended time during take-off

and descent from high altitude. In icing conditions the radio aerial suffered short circuits, leaving the crew without radio communication. While the life support system was undoubtedly a major improvement over the wartime piston-engined bombers, it gave cause for complaints on early-production IL-28s. In the summer the cockpit temperature at altitudes up to 2,000 m (6,560 ft) could reach 34°C (93.2°F), while in the winter at ambient temperatures of –25°C (–13°F) or less the cockpit heating was insufficiently effective.

Autopilot operation was unstable at speeds in excess of 500 km/h (310 mph); the AP-5 autopilot did not provide adequate heading stabilisation en route to the target area, impairing bombing accuracy. Also, the

This Soviet Air Force IL-28 is equipped with the Rym-S targeting system, the SP-50 ILS and the old Magniy IFF transponder (note the long blade aerial aft of the two DME aerials).

An IL-28 prepares to start the engines prior to a sortie; a ground crewman checks if the canopy is properly shut. An APA-7 ground power unit based on a Moskvich-400/420B pick-up provides electric power; such GPUs were more commonly seen at fighter bases in those days, the bomber units tending to use heavier stuff like the APA-1 or APA-2.

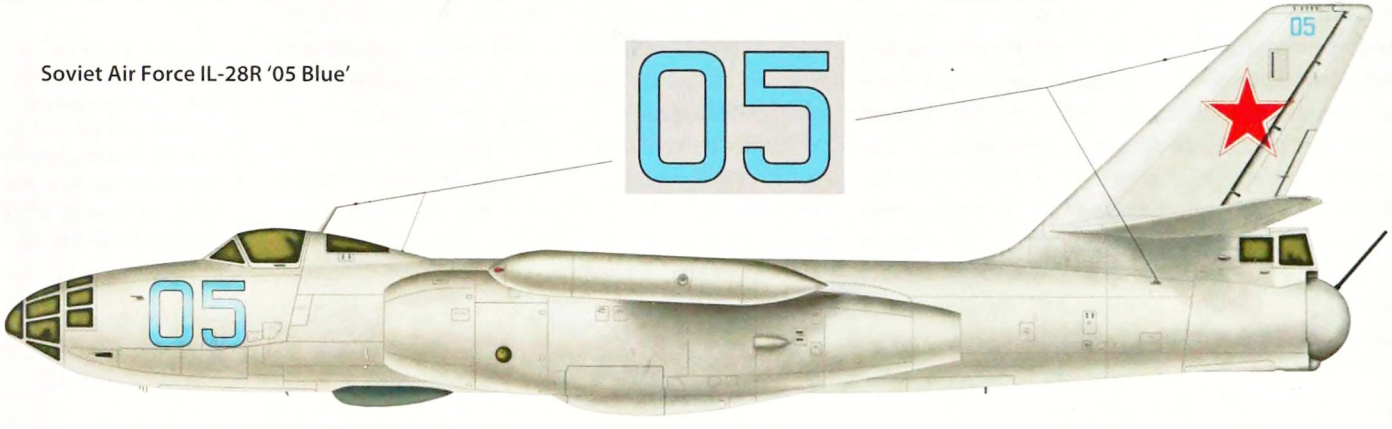
IL-28R '55 Blue' seen here on short finals has had black anti-glare panels added to the tip tanks.

military were unhappy about the Mach 0.78 speed limit imposed by the OKB which, in their opinion, restricted the bomber's capabilities – in particular, the ability to outrun enemy fighters. In theory the IL-28 could go 100-150 km/h (62-93 mph) over the speed limit in a shallow dive without disastrous consequences; however, in that case it became directionally unstable.

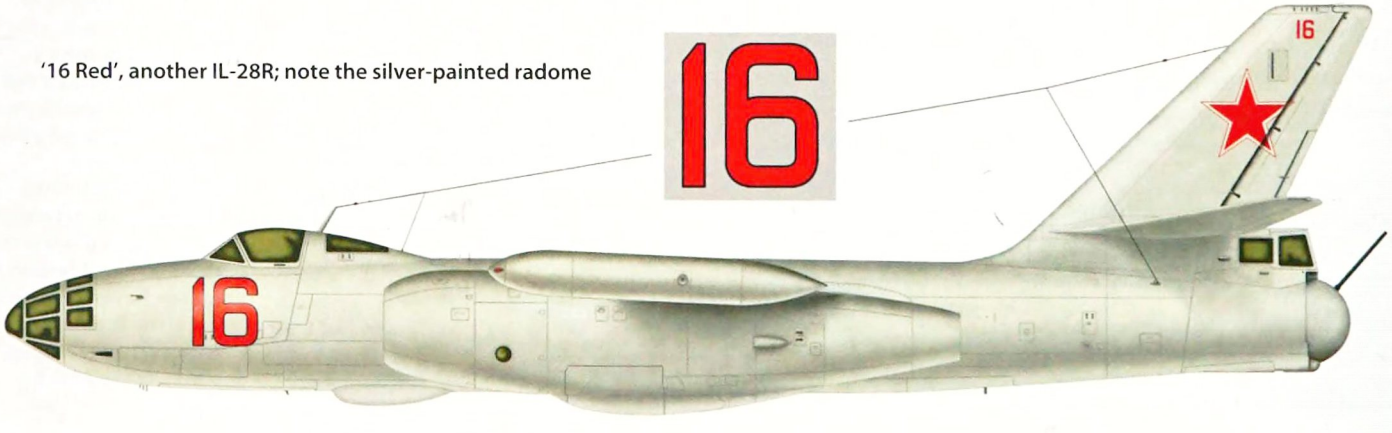
Early-production IL-28s with the IL-K6 turret had a tendency for the pitch-up rate to increase as the aircraft rotated for take-off. This tendency was alleviated by lightening the rear fuselage – not least thanks to the lighter IL-K6-51 turret.

Criticism was also levelled at the powerplant. Initially at low ambient temperatures the front and middle bearings of the engine spool ran cold and sometimes failed – both on the ground and in flight; it took the designers of the Klimov OKB a while to find a way of warming up the bearings, thereby curing the problem. The engines' FOD protection wire mesh screens tended to ice up in the winter, which sometimes resulted in flameouts. In the event of a single-engine failure full rudder deflection was required to keep the aircraft on a straight course; this was wearisome, since the IL-28's flight controls were unpowered.

Soviet Air Force IL-28R '05 Blue'



'16 Red', another IL-28R; note the silver-painted radome



'91 Red', another IL-28 with the Rym-S system, 'burns rubber' at the moment of touchdown.

In fairness, the aircraft itself was far from always at fault; a lot depended on the 'driver'. Engineer G. Ye. Dolgooshev, who was the Ilyushin OKB representative at the Voronezh aircraft factory from 1948, recalled that at the nearby training centre where Air Force pilots were converting to the IL-28 there were numerous cases of tailstrike on landing. The hydraulic drive unit of the tail turret was enclosed by a fairing projecting below the rear fuselage. When pilots hauled back on the control column at the moment of flareout, they often overdid it and the fairing was smashed against the runway, ruining the hydraulic drive, whereupon the complex and costly turret had to be replaced. When the training centre's command found this out, the pilots were given a dressing-down and ordered to lower the bomber's nose immediately after touchdown in order to avoid a tailstrike. Eventually this ended in disaster; one pilot overdid *this* order, dropping the nose so abruptly that the nose gear oleo was fully compressed and then rebounded, catapulting the nose into the air. As the angle of attack increased abruptly, the aircraft soared and the startled pilot countered by pushing the control column forward – too sharply; when the bomber landed hard, nosewheels first, the nose gear collapsed and the nose caved in, killing the navigator.

The Air Force's accident investigation panel decided to blame the aircraft, citing the IL-28's alleged propensity to bouncing on landing as the cause of the crash. When General Designer Sergey V. Ilyushin got wind of this, of course he disagreed and rose to the bait immediately. *'If they don't know how to fly properly, any aircraft will bounce* – he said. – *Give me a U-2, and I'll show you how you can make* ***this*** *aircraft bounce.'* He was, of course, referring to the Polikarpov U-2 trainer biplane famous for its benign handling and forgiveness even of grave pilot errors.

Seeing that the situation was getting out of hand, Dolgooshev attempted to intervene, suggesting that Ilyushin should demand the IL-28 pilot manual which

IL-28 '62 Red' taxies out for take-off. Again, the aircraft is radarless – the rod aerial of the Rym-S system is just visible below the radome.

Crewmen discuss something funny in front of a 748th GvBAP IL-28 coded '01 Red' (probably the regiment CO's aircraft) at Zaporozhye-Mokraya AB.

the military were using; he believed that it was the faulty landing procedures in the manual that had caused the pilot to act incorrectly and crash. However, Ilyushin was in no mood to take advice. *'You, Comrade Dolgooshev, stay out of it'* – he retorted, his use of this term of address and the last name indicating that the General Designer was extremely annoyed. The military were aghast and urged Ilyushin to drop his idea of 'showing how to bounce'; yet he insisted and did not back down until they grudgingly agreed that the IL-28 had no propensity to bounce. Then the abovesaid manual was dragged into the light of day, and the landing procedures had to be changed.

Now that we mention the tail turret, a separate bug was associated with the ventral access hatch of the tail gunner's station whose cover was designed to act as a slipstream deflector when bailing out. If this hatch was accidentally opened in flight it acted as an airbrake, creating a strong pitch-down force at the same time. By the time the pilot took corrective action and brought the aircraft under control, the IL-28 could lose 1,500 m (4,920 ft) of altitude; thus, a hatch popping open at low altitude often led to a crash.

748th GvBAP aircrews walk down the flight line past IL-28 '10 Red' after the day's flights.

Despite these initial grievances, the IL-28 was popular with aircrews and ground crews alike, and with good reason, too. The aircraft was easy to fly and operate, forgiving pilot errors and even some rather reckless manoeuvres; it was adequately armed and had a good safety and reliability record, once the learning curve had been overcome. Pilots accustomed to the spartan conditions of the Tu-2 with its cold and noisy cockpits were amazed by the comfortable and well-equipped cockpits of the *Beagle*. They were also quick to appreciate the IL-28's speed, rate of climb, good manoeuvrability and simpler take-off and landing techniques. The navigators found that the new bomber offered greater navigation and bomb-aiming capabilities in adverse weather. The tech staff, too, liked the IL-28 for its ease of access to the engines and all equipment items requiring maintenance in day-to-day service.

It is worth giving a description of the IL-28 from a pilot's point of view, especially since some of the *Beagle* pilots transitioned to it from fighters. I. Zakharov, a Barnaul Military Pilot College graduate who flew the IL-28 in the 1970s, commented on it as follows:

'But seriously – the good old "IL" was a unique aircraft, and I cannot help mentioning all its "merits". (The latter word was actually in quotes and can be used sarcastically to mean the opposite! – *Auth.*) *First of all, it was a three-seater. Previously you had been alone in the aircraft, and it was up to you to figure everything out and do everything; now you were the captain. In the nose you had the navigator, in the back there was the gunner/radio operator, "the eye in the captain's ass"* (*sic – Auth.*) *The aircraft was solidly built, everything was big and hefty. The wheels were as huge as those of a lorry. The internal canopy opening handle was a true replica of a meat grinder's handle; the emergency gear extension handle was a small red-painted crowbar on the cockpit floor, to the left of the seat. There was a small cooling fan in the cockpit, just like in the cab of a bus. A corrugated hose, like that of a gas mask, with a funnel at the end like resembling an old-fashioned pirate pistol, protruded from under the instrument panel; this was the ram air cooling pipe. Well, you would take this pipe and stuff it down the front of your trousers; until the aircraft climbed to 2,500 m [8,200 ft] and a valve shut off the ram air supply, it would cool everything inside your pants. After that, only the fan would blow hot air in your face.*

The IL-28 sat high above the ground on its landing gear, and a narrow stepladder was used for cockpit access. This stepladder was unstable, especially if the hardstand was icy or covered with snow. Quite often the technician climbing the ladder to open the canopy fell to the ground as the ladder slipped out from under him. If he grabbed hold of the cockpit sill in so doing, the heavy canopy could

IL-28R '19 Red', a 47th GvORAP aircraft, in the maintenance hangar. The tip tanks have been detached. The starboard VK-1A is uncowled and covered with a tarpaulin pending removal, with an engine transportation dolly in the foreground.

slam down on his fingers with such force that, for instance, technician Bokarev lost a pinkie this way. Therefore the prescribed procedure was that one man on the ground held the ladder in place while another climbed it.

You could not just pop open the bomb bay doors – there was a certain procedure to be observed. The doors were pneumatically actuated, with an air pressure of 50 bars [714 psi]. To prevent impact loads when opening or closing the doors on the ground, you had to call "Stand clear of the doors" from the cockpit, wait for the men outside to acknowledge the command, switch on counter-pressure and only then set the door control lever to "Open" or "Close". The bomb bay doors had sharp edges that were only as thick as the duralumin skin and could easily bite a log of wood in two. Therefore, when we wanted to play a prank on some unpopular technician we would wait for the "stand clear" command, then jump out from behind the aircraft parked alongside and quickly

A typical publicity shot showing an IL-28 crew discussing the details of the forthcoming sortie while a technician pushes a battery cart into position for engine starting and the crew chief watches this from the cockpit access ladder.

IL-28RTR '13 Red', AVMF/Black Sea Fleet, 819th GvBAP, 1960.

place a pair of brown boots (the kind worn by the ground crews) between the closing doors. The unsuspecting technician would climb out of the cockpit and be greeted with the sight of somebody's lags jammed by the doors! After he had recovered from the initial shock, he would start dashing all over the flight line in search of the pranksters.

In the summer the cockpit temperature could go as high as 70°C [158°F] when the aircraft sat parked in the open on a sunny day. I saw this reading myself on the cockpit thermometer once.'

Here, for comparison, is the commentary made by Col. Timofey P. Poonyov (Retd.) who started flying the IL-28 in the 748th GvBAP in 1953, transitioning to it from his wartime mount, the Pe-2.

'The most amazing thing about the IL-28, in my opinion, was the cockpit. It was unbelievable comfortable – pressurised, with effective and easily adjustable heating. The field of view was excellent – the aircraft had a bubble canopy and a tricycle landing gear. This allowed us to taxi at speeds of 60-80 km/h [37.2-49.6 mph]. The instrument panel featured a most comprehensive set of instruments. The IL-28 featured a few completely new instruments – the ADF, the PSBN radar, the RV-2 and RV-10 [radio altimeters], the Mach meter (this showed the relation between the aircraft's speed and the speed of sound; you could see how much was left until the red line, and if you were in the red field this meant you had exceeded the limit and the aircraft could begin "disassembling itself" any moment; there was the attitude and heading indicator of the ILS, etc. The

Naval Aviation pilot Maj. Timofey P. Poonyov with his mount, an 819th GvBAP IL-28RTR ELINT aircraft, at Vesyoloye AB in 1960. Obviously he did not believe in superstition, since he purposely chose the code '13 Red' for his aircraft – and flew without incident.

cockpit was crammed with instruments, and I liked them all [...] However, adding any more [instruments] would be too much; in fact, they needed to be grouped in order to give the pilot some general information. The instruments were everywhere. [...] For fuel and oil alone, [...] you had gauges for oil pressure, fuel pressure, fuel flow, two ingenious instruments showing the fuel quantity in the front and rear groups of tanks, and if there was less than 500 litres [110 Imp gal] in any group a red warning light came on.

There was a horn that sounded if you retarded the throttles to idle when the gear was up. One night our regiment was flying weapons practice sorties. One of our pilots throttled back to idle as he descended from 10,000 m [32,810 ft] – which is normal in itself. Of course the horn blared. This was at night, the descent was a long one, so the pilot got fed up with the horn and silenced it, using a special circuit breaker. He descended all the way to the ground, passing the outer and inner marker beacons, and only as he flared out did everyone see that his gear was still up. He belly-landed, scraping the fuselage and the nacelles along the tarmac in a shower of sparks; thankfully the aircraft did not catch fire. He climbed out and threw his helmet to the ground in disgust, calling himself an "old fool". And, mind you, he was a seasoned pilot!

The backrest and headrest of the pilot's seat were armoured. I don't know if they'd actually stop a heavy-calibre slug, but it was reassuring to know they were there. The navigator had no armoured backrest, but his station was separated from the cockpit by thick duralumin armour. There were no bulletproof windscreens; the canopy glazing was thick but ordinary.

The oxygen equipment was convenient and reliable. At first we were to don the oxygen masks because most of the flying was at high altitudes. However, out of habit we would don them only after climbing to 4,000 m [13,120 ft] and do without at lower altitudes. Later, an order was circulated that the oxygen system should be checked and the masks donned before take-off. [...] The oxygen supply lasted about four hours.

As such, the IL-28 was easy to fly; however, the control forces were a bit higher than those of the Pe-2 which you could literally control with your pinkie. Therefore, until we got accustomed, we tended to regard the IL-28's controls as a bit heavy; at maximum speed you almost could not move the controls – they just stayed neutral. Later we learned the reason, and from then on everything was normal. The [IL-28's] speeds are in a different league, and we were experiencing aerodynamic locking of the controls. But at the principal speeds of 700-800 km/h [435-496 mph] the IL-28 was easy to fly.'

The aircraft had a few quirks. For example, the flaps had no fixed settings – the setting depended on how long you held the three-position switch in the 'Down' or 'Up' position. When deploying or retracting the flaps, the pilot had to watch the vertical speed indicator and maintain level flight while turning the elevator trim handwheel at the same time; the latter had no fixed settings either, and it was easy to apply insufficient or excessive trim. Moreover, flap deployment caused the aircraft to pitch down while the increase in wing lift caused it to balloon, so the pilot found himself in the rather unlikely situation of having to fight unwanted descent and unwanted climb at the same time! In so doing the trainee had to endure the choice comments of the instructor in the front cockpit as to his flying skills, communicate with him and communicate with the tower at the same time. And mind you that there was no convenient intercom button; there was a three-position switch which the pilot had to work all the time to select intercom, radio or ADF mode because the ADF used the same wire aerial as the communications radio.

Speaking of communications, there was a tube with a sliding capsule between the cockpit and the navigator's station that could be used for exchanging handwritten notes! This was not pneumatic tube transport – the thing operated manually; it was a back-up for the intercom in case the latter (or the electric system at large) went unserviceable. It was a legacy of the days when bombers had no intercoms.

IL-28s built from 1955 onwards featured an AGB-1 or AGB-2 artificial horizon optimised for bombers (AGB = ***a****viagori****zont*** *bombardi****rov****shcika*) with a movable horizon bar instead of the earlier AGK-47B artificial horizon with a movable aircraft symbol. The compass and the ADF had separate indicators which, again, functioned differently from the customary flux gate compass. At first, pilots were unfamiliar with the new instruments and did not know how to use them properly, which resulted in a number of accidents caused by loss of attitude awareness.

Further complications were caused by the fuel system and the brakes. The fuel in the front and rear groups of tanks was used up at a different rate – the front group was larger, and the CG shifted forward as fuel was burned off. Hence the pilot had to transfer fuel between the two in order to maintain CG position; this process was not automated and the navigator monitored it, using a stopwatch on his instrument panel to tell the pilot when to switch off the fuel transfer pump. This was very distracting, especially during landing approach.

As for the brakes, there was nothing wrong with them as such, but on the IL-28 the brakes were operated by the rudder pedals instead of a grip on the control stick which many pilots were accustomed to. The powerful disc brakes were so effective that, as the CO of the 748th GvBAP put it, the aircraft *'bowed to every idiot on the airfield'* when the brakes were applied. Timofey P. Poonyov recalled that pilots accustomed to the Pe-2 would stand on the brakes out of habit, locking up the wheels and occasionally blowing the tyres as a result.

A publicity shot showing the crew of a Moscow-built IL-28 receiving a briefing... but there's one crewman too many!

Two IL-28s are refuelled by 7,000-litre TZ-200 fuel bowsers based on the MAZ-200 general-purpose lorry.

New combat tactics were developed for the type, since the IL-28 was introduced when the Cold War was at its peak and was expected to turn hot any moment. *Beagle* crews practiced night operations and close-formation flying in flights of three, squadron strength and full regiment strength; the distance between aircraft in a flight was no more than 40 m (130 ft) and the horizontal separation between flights in a regiment did not exceed 80 m (260 ft). As the VVS built up experience with the type, pilots started making formation take-offs from dirt strips in groups of three to nine aircraft.

Here it is worth quoting Timofey P. Poonyov once again. *'Bomb delivery on the IL-28 was performed at altitudes of 500 m [1,640 ft] or more. A bombing run at 500 m was considered low-level bombing. [Despite having forward-firing cannons] the IL-28 was not intended for strafing ground targets, and no strafing training routines existed for it. The OPB-6SR bomb sight – a "pirate copy" of the US Norden sight – was very accurate. At 10,000 m [32,810 ft] I could place my bombs on the target with a 30-m [100-ft] circular error probable. Of course I cannot guarantee such accuracy every single time, but at least I always achieved the "excellent" grade [for bombing accuracy] – and the qualification for that, if memory serves, is a CEP of 150 m [490 ft]; "good" was a CEP of some 200-300 m [660-980 ft] and "satisfactory" was a CEP of up to 400 m [1,310 ft].*

The OPB-6SR's biggest deficiency was its low ECM resistance. When our regiment flew with nukes, we made simulated bombing runs at the Navy base in Sevastopol' for practice purposes, but the city's air defences set up such strong ECM that nothing but the grid could be seen on the sight's radarscope. The navigator used to ask: "How on earth am I supposed to take aim?"

When we had mastered the IL-28 quite well and started flying high-altitude sorties, I, in my capacity as the regiment's Chief of Aerial Gunnery, calculated how strong

the enemy's resistance would be and how high own losses would be. It appeared that if we were to cruise at 10,000 m with a 15-second time separation (a very daunting task!), the losses seemed exorbitant – three bombers out of five would be shot down. So I came up with the idea of practicing low-level bombing – that is, from 400-500 m. The CO greeted the idea unenthusiastically. Small wonder – this technique was not in the field manuals, and nobody wanted to change the combat training schedule. But I kept bugging him and finally persuade him, saying, "I will be the first to do it". "Oh, you will? OK, you're flying a sortie tomorrow."

When I looked at the training flight schedule it became obvious to me that the CO had decided to scupper my plan. What I saw there was stuff and nonsense. My sortie was scheduled between 11 AM and 12 AM – in the summer! This meant the air would be hot and there would be terrible updrafts and downdrafts at low altitude. Now, the IL-28 is no crop-sprayer that flies nice and easy; on the "IL" it is akin to driving a horse-cart without springs at full speed over cobblestones, and without even a sack o' hay to protect your ass. Well, fly I did, but of course I got a bomb scatter of 1-1.5 km [0.62-0.93 miles]. When I landed and taxied in, the CO asked: "Well?.." "Well what? What did you expect? The aircraft was shaking so badly I could not see the instrument panel." The idea was shelved for a year or so, then we dusted it off. This time we did everything rationally, scheduling the flight for a day without turbulence, and everything worked out right. And the predicted own losses turned out to be much lower.'

From time to time the *Beagle* units deployed to remote bases for training purposes; for example, the IL-28s of the 63rd BAD would roam as far as Karshi in south-eastern Uzbekistan (Central Asian MD) and Maryy (pronounced like the name Marie) in Turkmenia (Turkestan MD). During such deployments the crews would practice bombing 'raids' at unfamiliar target ranges. Bombs were delivered from altitudes of 100-10,000 m (330-32,810 ft), both by single aircraft and formations of varying size. Special targets with Luneburg lenses to provide a high radar signature were built at such ranges. Still, occasionally disoriented bomber crews would unload their bombs on the grain processing units or vehicle depots of nearby collective farms, since their image on the PSBN-M's radar display was very similar to the practice targets. Fortunately the damage was usually minimal because 75-kg (165-lb) PB-50-75 practice bomblets were normally used. On one occasion, however, a major disaster was averted at the last moment. Sometime in the late 1950s a visiting 277th BAP IL-28 took off from the airbase near the Ukrainian city of Stanislav (renamed Ivano-Frankovsk in 1962) and headed north-west on a night weapons training sortie, carrying a live 1,000-kg (2,204-lb) FAB-1000 high-explosive bomb. The objective was a target range 7.5 km (4.6 miles) north-east of Kamenka-Boogskaya (L'vov Region), but the aircraft strayed to the south of its intended course and overflew the city of L'vov instead. By sheer luck the bomb-aimer happened to look away from the radar display a few seconds before the drop and saw the city lights below.

IL-28 crews in light-coloured summer flying suits at Dallyar AB, Azerbaijan, in 1973.

Penetrating enemy air defences was an important aspect of the IL-28 crews' combat training. Mock combat with MiG-15s and MiG-17s impersonating enemy fighters showed that a fighter armed solely with cannons had no chances of stopping the *Beagle*. If intercepted in head-on mode, the bomber's high speed and the resulting huge closing rate left the fighter pilot little time to take aim (quite apart from the fact that the IL-28 had a pair of forward-firing cannons with which to discourage such attacks). In pursuit mode the bomber's highly effective cannon barbette enabled it to repel stern attacks successfully.

Here's a further excerpt from Timofey Poonyov's reminiscences. *'I rate the efficiency of the tail cannon installation protecting the aircraft against fighter attack in rear hemisphere as excellent. [...] The cannons were actuated hydraulically and aimed by an ASP-3 automatic sight [...] enabling very accurate aiming. The GRO used two adjustment knobs – one for target range, the other for target speed. Everything else was automated. [...] During the GROs' training we made them memorise the wing span of the potential adversary's fighters, and by turning a special knob you could set the target size. This device dramatically enhanced target lead accuracy. The only hitch of the aiming system was that the hydraulic drive could move the cannons so quickly that the gyros tumbled, putting the sight out of action – true, only briefly, but still it was a malfunction. Therefore the GROs were trained to move the cannons smoothly; no need to be jumpy if you have the enemy in your sights – there's plenty of time.*

Later, when posted in the Crimea (in the Black Sea Fleet's 819th GvBAP – *Auth.*), *I, being the regiment's Chief of Aerial Gunnery, constantly organised joint operations with the fighter regiments based at Dzhankoy and Sovetskoye. [...] They practiced attacks, we practiced anti-*

IL-28R '16 Red' in action; note the open camera port for an oblique camera in the rear fuselage.

fighter defence. It went well. One day we decided to teach the fighter pilots a lesson because they were getting snooty – like, "ay, we'll have you any time o' day". Okay, guys, let's fly. This time, however, we flew at 10,000 m [32,810 ft] instead of 8,000 m [26,250 ft] and at 900 km/h [559 mph] instead of 700 km/h [435 mph]. True to form, the fighters tried an attack from below; they zoomed up smartly but could not catch us and fell behind, being short on speed. Then they called us on the radio: "Hey you, bomber guys... ease up a bit! Let us attack!" Speed plus tail cannons gives you good chances of success in an encounter with a fighter such as the MiG-15 or MiG-17. The pilot, too, could nail the fighter with the forward-firing cannons if the fighter pilot got careless at the end of the attack run, but such opportunities were rare. The tail gunner's weapons were boresighted for a range of 800 m [2,625 ft].

The IL-28's rate of climb was 20 m/sec [3,940 ft/min]. The top speed was determined by the Mach limit and varied, depending on the altitude; for example, at 10,000 m it was 900 km/h. Even though the bomber could match the fighters in speed, it was no match for them as regards acceleration. Our all-up weight was 23 tons [50,705 lb] in high gross weight configuration and 21 tons [46,300 lb] at normal gross weight. Of course, our aircraft was much less agile than the MiG-15 and MiG-17. I have to say that from our point of view the MiG-15 and MiG-17 were no different as far as repelling their attacks is concerned, even though the two types' performance differed somewhat; other types of fighters were not pitched against us in mock intercept sessions. [...] We also practiced co-operative tactics where the fighters were protecting us. I used to draw diagrams showing who was supposed to be where – we, the ECM group, the close escort and top cover groups. We practiced that in real life, and, together with the fighters, the bomber regiment made up an impressive armada. Still, such formations did not take SAMs into account; to all intents and purposes, they were outdated. [...]

Not much can be said about the IL-28's vertical manoeuvrability. As for horizontal manoeuvrability, the turn radius could be as much as 13 km [8 miles]. Regarding combat manoeuvres, we had a so-called standard: a shallow banked turn, a steep banked turn and a combat turn. We trained to do left and right turns of these kinds, and that was all as far as aerobatics are concerned. In a combat turn the aircraft effortlessly gained 900 m [2,950 ft] of altitude. It was overpowered, and you had to watch the speed so as not to exceed the limit – and it was easy if you gave those engines half a chance. The IL-28 flew well on one engine – in fact, it could even climb on one engine. A very valuable property.'

The advent of the Mikoyan/Gurevich MiG-19 *Farmer-A/C* supersonic day fighter did not make things easier for the 'adversaries' – in fact, it made them harder because the closing speed was now greater, and in a stern attack the bomber pilots would reduce the speed, causing the fighter to overshoot. It was not until the all-weather MiG-19PM *Farmer-D* armed with RS-2-U (K-5M; NATO codename AA-1 *Alkali*) air-to-air missiles came on the scene that the tables were turned. In the West, fighter development proceeded along much the same lines. Thus, even when NATO had sufficient numbers of North American F-100 Super Sabres, Republic F-105 Thunderchiefs and SAAB J-35 Drakens based in Europe, the IL-28 stood a fair chance of getting away from them, especially when flying at ultra-low level.

While we are on the subject of aerial gunnery, it deserves mention that while IL-28 pilots and navigators were officers (of course), the GROs were often enlisted

men (privates/sergeants or, in the Naval Aviation, seamen/petty officers) serving their two- or three-year conscription term. Such enlisted men were carefully picked (they needed to be both physically fit and clever enough) and carefully trained. *'The GRO has to operate very complex equipment* – Timofey P. Poonyov reminisced – *and if he hasn't got the brains to use it, he'll be worthless. [...] We had good training facilities. [...] One simulator, a capsule the size of a compact passenger car, was worth 1 million roubles in the day's prices* (pre-1961 denomination roubles – *Auth.*) *We would put a person in it; the capsule was installed on articulated supports and moved by hydraulic actuators, emulating the bomber's manoeuvres, while the targets – silhouettes of fighters – moved on special rails in front of it. It was a fairly faithful reproduction of a fighter attack. The thing was expensive, but it was very effective – after four months' intensive training the rookies became top-notch gunners.'*

For the Western world the hundreds of nuclear-capable IL-28 bombers were one of the personifications of the tell-tale Soviet Threat – and with good reason, too. The crews of these aircraft were carefully chosen and received especially rigorous training. Each crew was assigned a primary target and several alternate targets in Western Europe: nuclear weapons depots, airbases etc. For instance, the abovementioned 63rd BAD in the Carpathian MD was to attack targets in West Germany.

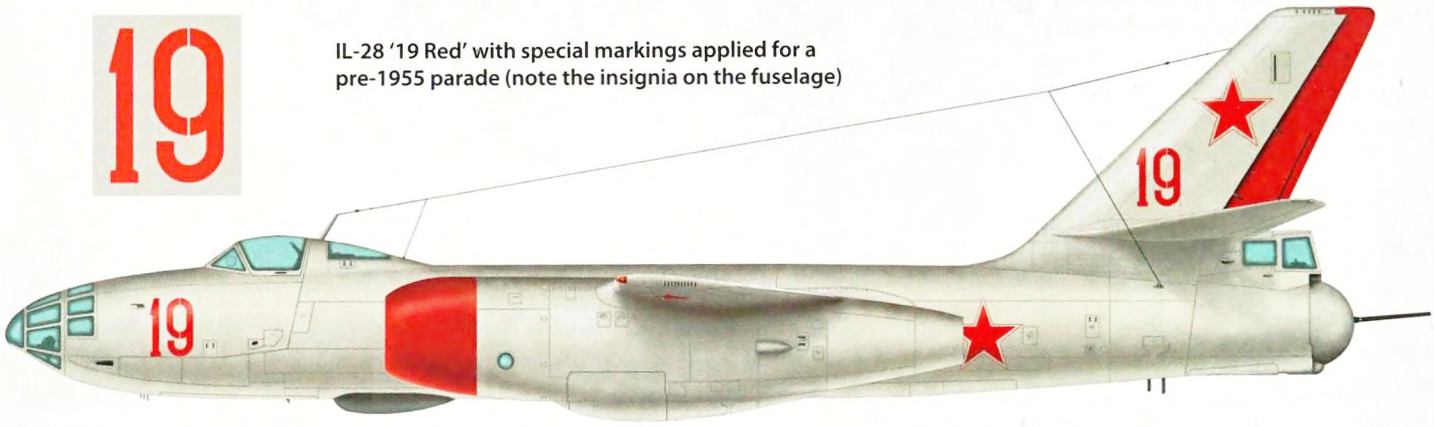
The *Beagle* soon earned a reputation for sturdiness and reliability. On one occasion a 4th GvBAP IL-28 from Chernyakhovsk ditched in the Baltic Sea after an unspecified malfunction; it remained afloat for more than two hours before being towed to the shore and was eventually returned to service. On reflection, this seems improbable because the aircraft was bound to suffer from salt water corrosion after such an immersion.

Here, personnel in full NBC protection suits 'decontaminate' parked *Beagles* and *Mascots* after a simulated nuclear or chemical attack during an exercise.

On another occasion a 408th FBAP IL-28U hit a storm cloud at 6,000 m (19,685 ft). Squadron commander Konoplyannikov, who was in the instructor's seat, throttled back the engines and brought the aircraft to straight and level flight as the trainer emerged from the cloud at 1,800 m (5,900 ft). On the ground it was discovered that the aircraft had several holes in the skin burned by lightning strikes and the paint on all leading edges was sandpapered away by hail.

In 1973 or 1974 an IL-28 piloted by Vyacheslav M. Shvechikhin, with Anatoliy Posokhin as navigator, was returning to base after an attack run during a combat skills contest between several units. Flying low over

IL-28 '86 Red' is seen a few seconds before touchdown.



IL-28 '19 Red' with special markings applied for a pre-1955 parade (note the insignia on the fuselage)

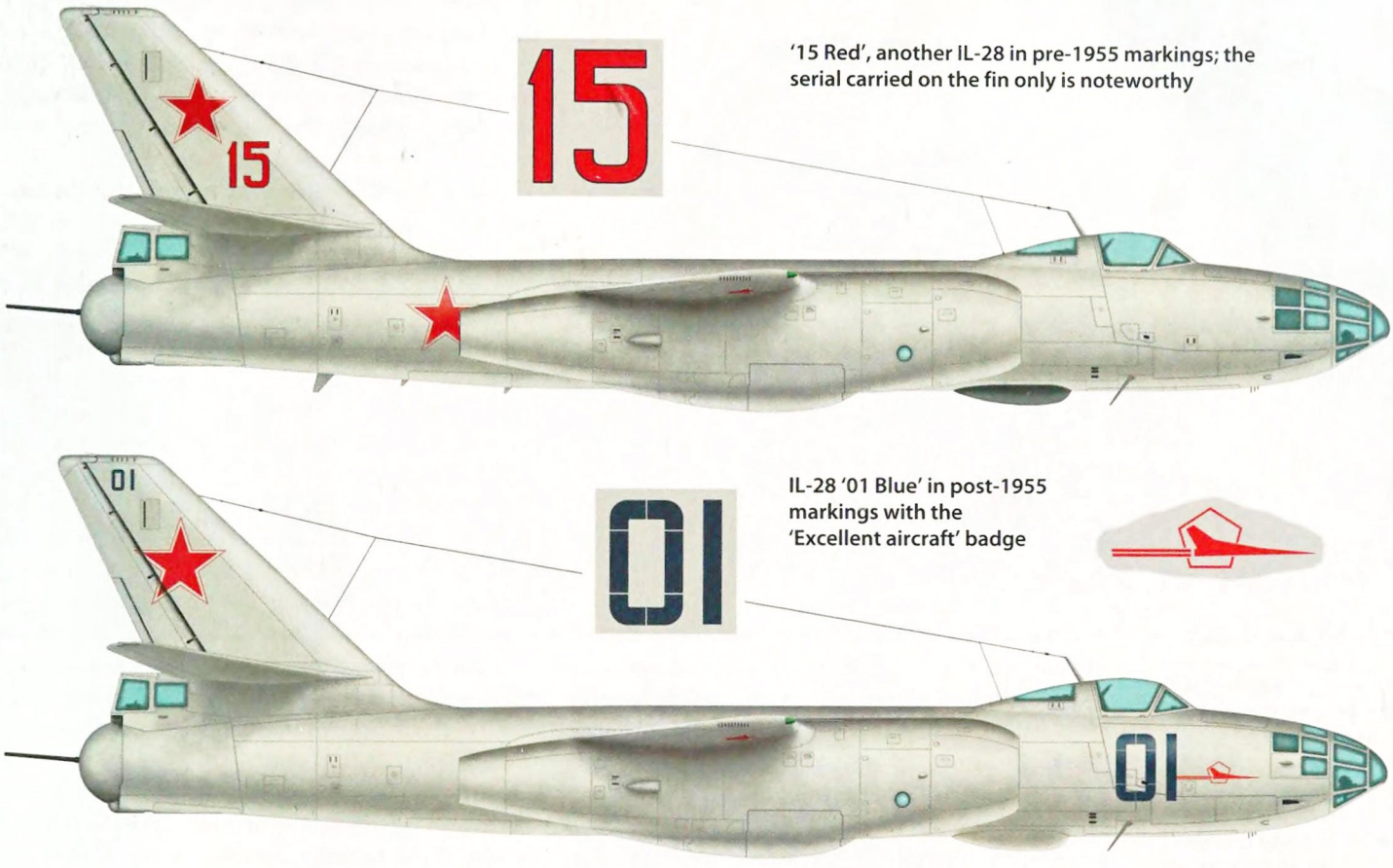
The 'invasion stripes' on the fuselage of IL-28 '11 Yellow' designate it as an adversary aircraft during a war game

swampland, the bomber clipped a dead tree and landed with fragments of branches stuck in the wing leading edge. About the same time, when the 277th BAP had converted to the IL-28Sh attack version, a flight of three *Beagles* was attacking a target at the Santakheza (aka Novosel'skiy) practice range in the Primor'ye Territory with S-5 FFARs when a rocket fired by the regiment CO Ghennadiy Chernov went haywire. Swerving to the left, it struck the starboard engine nacelle of another IL-28Sh, wrecked the cowling and lodged in the engine's FOD protection screen. Mercifully the rocket did not explode and the incident was not discovered until the bombers landed at Khorol' AB north of Ussuriysk; the crew had not felt the impact, nor were there any abnormalities in the engine's operation. The bomber was patched up overnight in the base's aircraft maintenance shop and flew home to Khoorba the following morning.

Speaking of engines, the VK-1 earned high praise for its dependability. Quite often IL-28s 'devoured' birds or struck treetops during low-level missions, ingesting branches; still, the engines usually stood up to this abuse and kept running!

The IL-K6 turret, too, turned out to be incredibly reliable. An aircraft technician who used to work in a Soviet unit stationed in Poland recalled how he once decided to check the turret's hydraulic system for malfunctions because the pressure was at the lower limit of the manufacturer's tolerance. The crew chief took him to the aircraft, showed him the manufacturer's anti-tamper seal on the turret, which had never been touched in the 23 years since the aircraft was built, and said: *'Don't fix it if it doesn't break'*.

Still, IL-28 operations both in the Soviet Union and abroad were inevitably accompanied by a good deal of accident attrition. The first known loss was on 22nd September 1950 when a Soviet Navy (Baltic Fleet/8th MTAD) IL-28T crashed, killing the crew – pilot Lt. (SG) Vladimir N. Yankovskiy, navigator Lt. Leonid A. Merzlyakov and GRO Sgt Timofey Ye. Derkoonskiy. The cause of the crashes was often the tell-tale human factor. Some fatal accidents were cases of controlled flight into terrain (CFIT) caused by loss of attitude awareness in poor weather. For example, on 28th August 1959 a Soviet Navy (Pacific Fleet/567th GvMTAP) IL-28N ('24 Red', c/n 55006728) collided with the Livadia mountain range 660 m (2,165 ft) above sea level on approach to Nikolayevka AB, killing pilot Lt (SG) Lavrentily S. Soldatenko, navigator Lt (SG) Boris I. Stookov and GRO Seaman Pyotr K. Kozlov. A similar accident in the Pacific Fleet's 36th MTAP on 10th May 1958 was caused by an error of the air traffic control officer at Nikolayevka who gave the pilot wrong commands.



'15 Red', another IL-28 in pre-1955 markings; the serial carried on the fin only is noteworthy

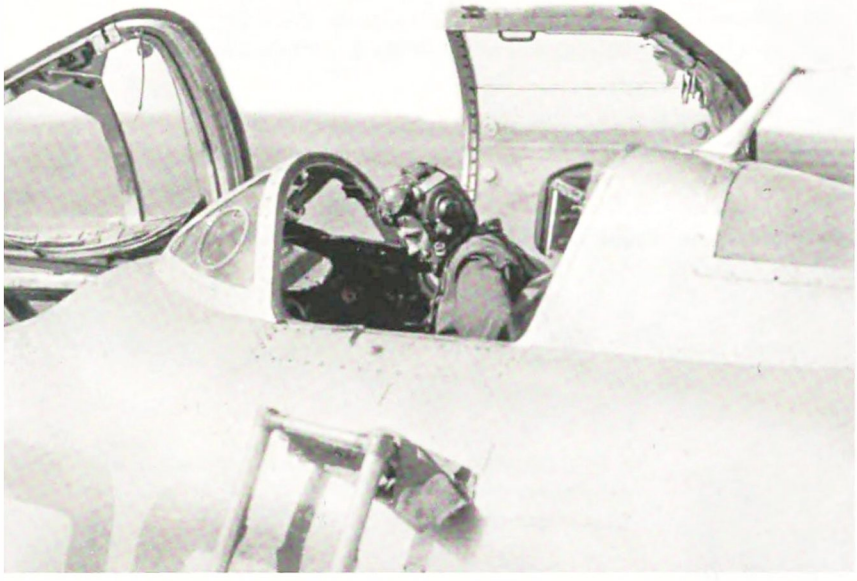
IL-28 '01 Blue' in post-1955 markings with the 'Excellent aircraft' badge

On 10th April 1964 a Polish Air Force/7th Bomber Brigade IL-28, 40 Red (c/n 56219), was flying over Czechoslovakia, impersonating a hostile aircraft in the course of a Warsaw Pact exercise. The pilot of the intercepting Czechoslovak Air Force MiG-19PM messed up the target approach and the two jets collided, the IL-28 bursting into flames and flicking into a spin. Only the pilot, Lt. Henryk Szeliga, managed to eject; the navigator and the GRO were killed when the bomber crashed on the outskirts of Prague. The CzAF acknowledged its fault and transferred one of its IL-28s to Poland as compensation in December 1965.

Some accidents, however, were caused by hardware failure. On the night of 8th/9th August 1956 a Soviet Air Force/157th BAD suffered an uncontained engine failure when flying a sortie from the airbase located on the eastern outskirts of Shchoochin (Grodno Region, Belorussia). The radio operator panicked and bailed out without being ordered to do so. Pilot Lt (SG) Kuz'ma N. Lukonin and instructor pilot Maj. Ryabikov could have ejected, but they chose to stay with the aircraft and try to land it, having no contact with the radio operator and not being sure if he had bailed out; they were killed when the trainer collided with the ground. Also, most of the crashed naval IL-28s were equipped with a new type of artificial horizon (AGB-1 or AGB-2) featuring a different method of attitude indication as compared to the AGK-47B used hitherto; this could provoke pilot disorientation in clouds and CFIT.

As of 1st January 1955, the Soviet Air Force's Tactical Aviation arm (FA – *Frontova**ya** avia**ht**siya*) alone had more than 1,650 IL-28s in service with 30 bomber regiments. Two bomber divisions had 'special' status (with the word 'special' included into their designations), as they were equipped with IL-28N bombers meant to carry special stores.

The IL-28R reconnaissance version was to be fielded as early as 1951, the appropriate Council of Ministers directive envisaging four independent (i.e., direct reporting) air regiments with 20 aircraft apiece. Three of these (stationed in the Soviet Far East, in Transcaucasia and in the Soviet Occupation Zone of Germany) were to report to the Soviet Army General Staff; the fourth was to be a naval unit reporting to the Navy General Staff, with two squadrons stationed as far apart as Murmansk in the High North and the Crimea Peninsula in the south. Re-equipment from the Tu-2R and the older Pe-2R was to proceed on a squadron-by-squadron basis and in the following order: the Far East (this enjoyed top priority because the Korean War was raging nearby), Germany, the Navy, Transcaucasia. However, the IL-28R's late production entry scuppered these plans. It was not until 1953 that the Air Force's reconnaissance units began re-equipping with the *Beagle*.



Aleksey Veshkin, a cadet of the Barnaul Military Pilot College (BVVAUL), in the trainee's cockpit of an IL-28U at Slavgorod-North AB in 1974.

The 47th GvORAP (*Gvar**dey**skiy ot**del'**nyy raz**ved**yvatel'nyy **a**via**polk*** – Guards Independent Reconnaissance Air Regiment), which was then based at Migalovo AB, was one of the first to master the IL-28R pursuant to an Air Force General Staff directive dated 20th January 1954. The first ten crews took their training directly at the Voronezh plant, whereupon the unit took delivery of its first five IL-28Rs and two IL-28U trainers in March 1954. Despite being an Air Force unit, the 47th GvORAP flew maritime reconnaissance missions as well, reconnoitring shipping lanes in the Baltic Sea and the Black Sea. Later the regiment moved to a new home at Shatalovo AB, Smolensk Region.

BVVAUL instructor Maj. Sergey Ye. Brusnitsyn in the cockpit of an IL-28 – this time the bomber version.

The second VVS unit to receive the type was the 75th OKRAE (*ot**del'**naya korrekti**rov**ochno-raz**ved**y-vatel'naya **a**viaeskad**ril'**ya* – Independent Artillery Spotting & Reconnaissance Squadron) whose crews were trained by 47th GvORAP instructors at Migalovo. In the Belorussian MD, the two-squadron 10th ORAP converted to the type at Bronnoye AB in 1953, operating from Beryoza AB (Brest Region) in 1960 and Shchoochin in 1961.

The 98th GvORAP flew the type from Monchegorsk (Murmansk Region) in the High North (Leningrad MD), operating over both land and sea; it also had IL-28PP ECM aircraft on strength. On overwater missions the unit's IL-28Rs occasionally had close encounters with NATO aircraft. Once a 98th GvORAP IL-28R managed to outrun a US Navy Lockheed P-3 Orion ASW aircraft attempting to shadow it, despite the fact that the well-worn VK-1 engines were delivering less than full power and the *Beagle* was unable to go faster than 750 km/h (466 mph).

In the Transcaucasian MD, the IL-28R served with the 34th VA's 882nd *Til'**zit**skiy* ORAP, which earned its name for its part in taking Tilsit during the war. The regiment was based at Dallyar AB in Azerbaijan, occasionally referred to as Shamkhor after a nearby city. A further reconnaissance unit equipped with the IL-28R was the 357th ORAP of the 45th VA stationed at Chita (Transbaikalian MD).

In the early days, as already mentioned, conversion training of aircrews and ground crews took place directly at the factories building the IL-28. However, shortly after the type entered service the Tactical Aviation's 4th TsBP i PLS (*Tsentr boye**voy** podgo**tov**ki i pere**oo**chivaniya **lyot**novo sos**ta**va* – Combat Training & Aircrew Conversion Centre) named after Valeriy P. Chkalov in Lipetsk, central Russia, started training *Beagle* crews.

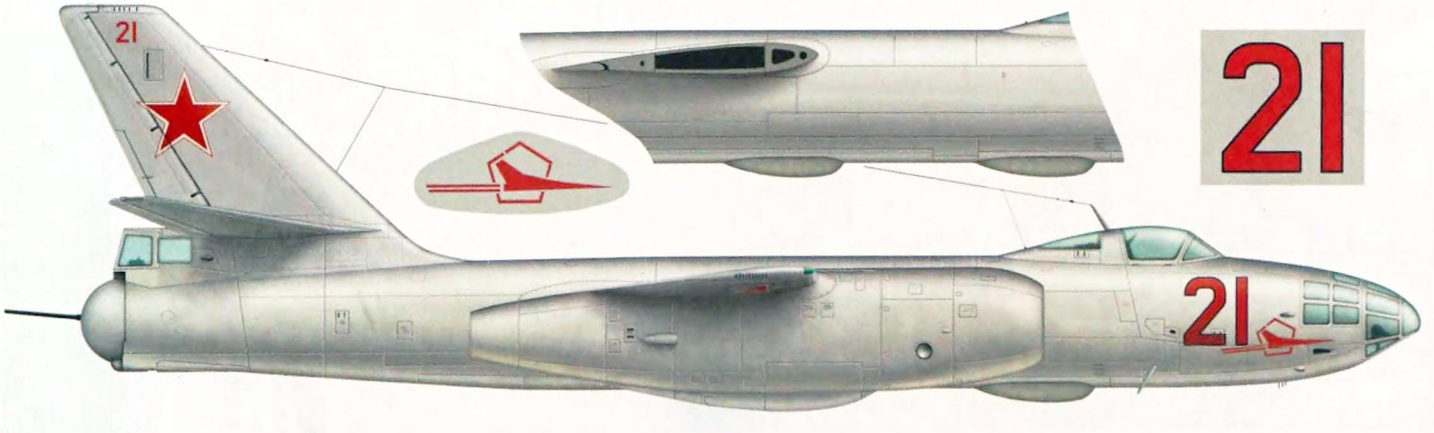
In addition, the Soviet Air Force's flying schools also started taking delivery of the IL-28. The first of these was the Engels Military Pilot School named after the famous record-setting aviatrix Marina M. Raskova in the town of Engels (Saratov Region, southern Russia). Lieutenant Senior Grade V. S. Gladkov, who flew an IL-28 in the 408th FBAP, reminisced: *'My first acquaintance with the IL-28 was in the Engels Military Pilot School [...] in 1954. We were the first cadets who were specially trained to fly the type after mastering the Tu-2. As compared to the latter, the new aircraft seemed like something straight out of science fiction; its performance was amazing, and so was the manufacturing standard.'*

In 1954 the school moved to Tambov-Tsentral'nyy AB and was reorganised as the Tambov Military Pilot College (TVVAUL – *Tam**bov**skoye **vys**sheye vo**yen**noye aviatsi**on**noye oo**chil**ischche **lyot**chikov*) – likewise named after Marina Raskova; it continued operating the IL-28 at the new location. Originally the conversion training was a two-stage process: the cadets made a number of flights in the Tupolev UTB-2 (a special trainer derivative of the Tu-2 with less powerful engines and

Above: Two IL-28s operated by TVVAUL at Tambov-Tsentral'nyy AB. '01 Red' wears the 'Excellent aircraft' maintenance award badge – a spin-off of the pentagonal State Quality Mark.

Left: BVVAUL cadets V. Galakhov, V. Steklyannikov and V. Kholodnyy pose with IL-28RTR '21 Red' at Slavgorod-North AB in 1973.

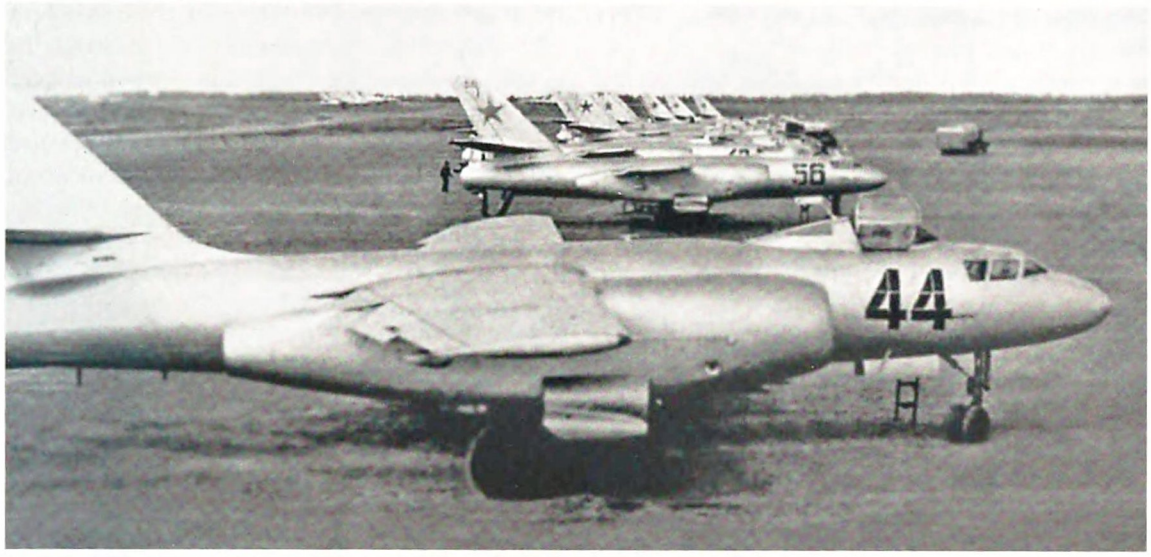
IL-28RTR '21 Red', BVVAUL, with scrap view showing the ELINT antenna fairing.



side-by-side seating for the trainee and the instructor) before transitioning to the IL-28. The tailwheel-gear UTB-2 was to be superseded by the purpose-built Yakovlev Yak-200/Yak-210 tricycle-gear trainers, the latter version even having a bomb-aiming radar, but these piston-engined types were obsolete even as they were born; from 1954 onwards the cadets moved straight on to the IL-28.

Other Air Force schools operating the type were the Omsk Military Pilot School, which closed in the 1960s; the Stalingrad Military Pilot School (until 1969); the Orenburg Military Pilot College (OVVAUL – *Oren**boorg**skoye **vys**sheye voy**en**noye aviatsi**on**noye oo**chil**ishche **lyot**chikov*); and the Barnaul Military Pilot College (BVVAUL – *Barna**ool'**skoye **vys**sheye voy**en**noye aviatsi**on**noye oo**chil**ishche **lyot**chikov*).

Established in 1966, the BVVAUL had three training air regiments, including the 59th UAP (*oo**cheb**nyy **avia**pol**k*** – Instructional Air Regiment) in the town of Slavgorod (the Altai Territory of Russia) which was established in keeping with a General Staff directive dated 29th December 1967. Actual formation of the regiment began in October 1968 and it was commissioned on 1st December; the first sortie of a 59th UAP IL-28 took place on 14th January 1969. The unit operated from Slavgorod-North AB, which had a paved runway and Slavgorod-South AB, which had two dirt airstrips. As early as August 1969 the regiment participated in its first Siberian Military District exercise, making live bomb drops. A few days later nine 59th UAP IL-28s made a low-altitude close-formation flypast over Barnaul's main street, Prospekt Lenina (Lenin Avenue), on Aviation Day (the third Sunday of August), wowing



Left: Three IL-28Us on the TVVAUL flight line at Tambov-Tsentral'nyy, with bombers further down the line and a 22,000-litre TZ-22 articulated fuel bowser in the background.

Opposite page, top and centre: Two IL-28s operated by TVVAUL drop practice bombs.

Opposite page, bottom: IL-28U '84 Red' basks in the sunshine at Slavgorod-North AB in 1974 as a sister ship makes a low flypast in the background.

A fine study of IL-28U '95 Red' taxying out for take-off with the flaps set 20°.

the audience. Training of BVVAUL cadets in the 59th UAP commenced in March 1970. In 1972 the regiment was declared the best Air Force unit in the Siberian MD. In 1978 the 59th UAP stopped training cadets on the IL-28 and converted to the Aero L-29 Delfin single-engined advanced trainer in 1979.

(As an aside, the acronym BVVAUL was, confusingly, also used for two other Soviet Air Force pilot colleges – the ones in Balashov and Borisoglebsk.)

The 29th OUTAP (*ot**del'**nyy oo**cheb**no-treni**rov**ochnyy **avia**polk* – Independent Instructional & Training Air Regiment) established in 1968 was originally based at Sital-Chai AB in Azerbaijan, operating various versions of the IL-28, including the IL-28R and IL-28U. In 1970-71 the unit was briefly stationed at Dallyar due to runway resurfacing work at Sital-Chai. In the early 1980s it moved to Berdyansk in the Ukraine.

The Chelyabinsk Military Air Navigator College (ChVVAUSh – *Che**lya**binskoye **vys**sheye vo**yen**noye aviatsi**on**noye oo**chil**ishche **shtoor**manov*) at Shagol AB a short way north of Chelyabinsk (Urals MD) started re-equipping with the IL-28 in 1954. Also, the 23rd Military Air Navigator School with a regiment of IL-28s was initially based at Bada AB (Chita Region, Transbaikalian MD) – to be precise, the southern of the two bases at Bada; later it moved to Shadrinsk (Kurgan Region) in the south of the Urals Mts.

Ground crews for the IL-28 were trained, among other things, at the Irkutsk Military Aviation Technical School (IVATU – *Ir**koot**skoye vo**yen**noye aviatsi**on**no-*

*tekh**nich**eskoye oo**chil**ishche*) and the Achinsk Military Aviation Technical School. The IL-28 had a ground crew of seven technicians. In the early 1950s, when no real IL-28s could be spared for use as teaching aids yet, IVATU constructed an interesting *ersatz-Beagle* by fitting a retired Tu-2 airframe with VK-1 engines in IL-28 style nacelles and a conventional tail unit instead of the stock twin tails. The aircraft was trestled in a tail-up position to emulate the IL-28's ground attitude and used for practicing engine maintenance and starting procedures.

In the event of war the tactical scenario for the *Beagle* units was approximately as follows. Each IL-28N toting a nuclear bomb would be accompanied by at least a squadron of *Beagles* tasked with the ECM and air defence distraction role. At first the bomber formation would cruise at 10,000 m (32,810 ft) in order to save fuel. Then, setting up an ECM barrier, the bombers would descend to low altitude over Poland to avoid detection by the powerful surveillance radar in West Berlin – NATO's first line of defence; some of the aircraft would leave the formation, making deceptive manoeuvres to confuse the AD radar operators. The same tactic was used to get past the numerous Western Electric MIM-3 Nike Ajax, Western Electric MIM-14 Nike Hercules and Raytheon MIM-23 HAWK SAM sites. Eventually the IL-28N would be left all alone, pressing on towards the target at treetop level. Then it would climb sharply to 1,000 m (3,280 ft), allowing the navigator to identify the target, whereupon the bomb was dropped and the aircraft headed back, descending to ultra-low level again. The idea was that the IL-28's high speed would enable it to outrun the blast wave and the crew would be protected from the flash by special blinds.

All manner of unusual – and occasionally amusing – episodes happened during the bomber's service career. For example, the PSR-1500-15 JATO boosters were rarely used operationally (and then mostly for training purposes), but one case merits attention. In the mid-1950s an IL-28 from a first-line unit suffered a dual engine flameout; fortuitously, the pilot spotted a strip of land about 300 m (980 ft) long on the edge of a village and made a perfect dead-stick landing in what turned out to be a vegetable garden. In spite of the belly landing the aircraft was virtually undamaged; nor was there any collateral damage because the incident was in March and there were no crops yet. Since the aircraft was almost new, dumping it was not an option, and the question arose of how to salvage it. Dismantling and recovery by road, with subsequent reassembly, was considered too complicated, and someone suggested flying the aircraft out under its own power, with the help of JATO boosters. The aircraft was jacked up, the landing gear was extended and the boosters were fitted; meanwhile, a team of farm hands summoned to help packed the soggy earth by means of a sheet of metal towed by a tractor. In the morning, when the night frost had created a sufficiently firm surface, GK NII VVS test pilot Lt.-Col. Yuriy V. Sookhov flew the aircraft back to base. The take-off run with the boosters was just short enough for the bomber to become airborne at the edge of a deep gully.

A persistent legend in the Soviet/Russian Air Force has it that two technicians in a bomber unit once laid hands on a JATO booster for the IL-28 and decided to try it on a Ural motorcycle. No sooner said than done: the booster was installed between the motorcycle and the sidecar, the two chaps drove out onto the runway and... One version of the story says that the riders fell off 20 m (65 ft) and 100 m (330 ft) after ignition point, and that the motorcycle was found beyond the inner marker beacon. A more macabre version of the ending is 'there was nothing left to bury'.

Speaking of tall stories, here's one more associated with the *Beagle*. After the Ilyushin OKB had made some updates, a bomber unit equipped with IL-28s received orders that all the aircraft be urgently upgraded. The work had to be done indoors, and the base's maintenance hangar was too small to accommodate all the aircraft at once. The unit's tech staff found themselves between a rock and a hard place. If the upgrade was done piecemeal, with several bombers hangared at a time, it was impossible to meet the

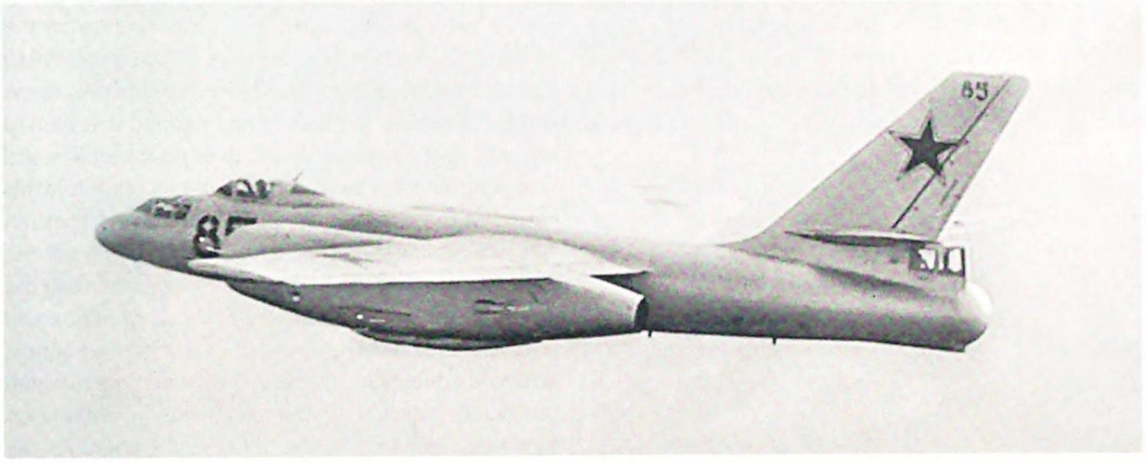
Below: IL-28U '72 Red' seen immediately after touchdown.

Bottom: A *Mascot* flies in a somewhat unusual configuration with the gear down (despite the fairly high altitude) and the flaps up.

Under the watchful eye of the technicians, the crew of IL-28U '85 Red' start the engines on an unpaved flight line.

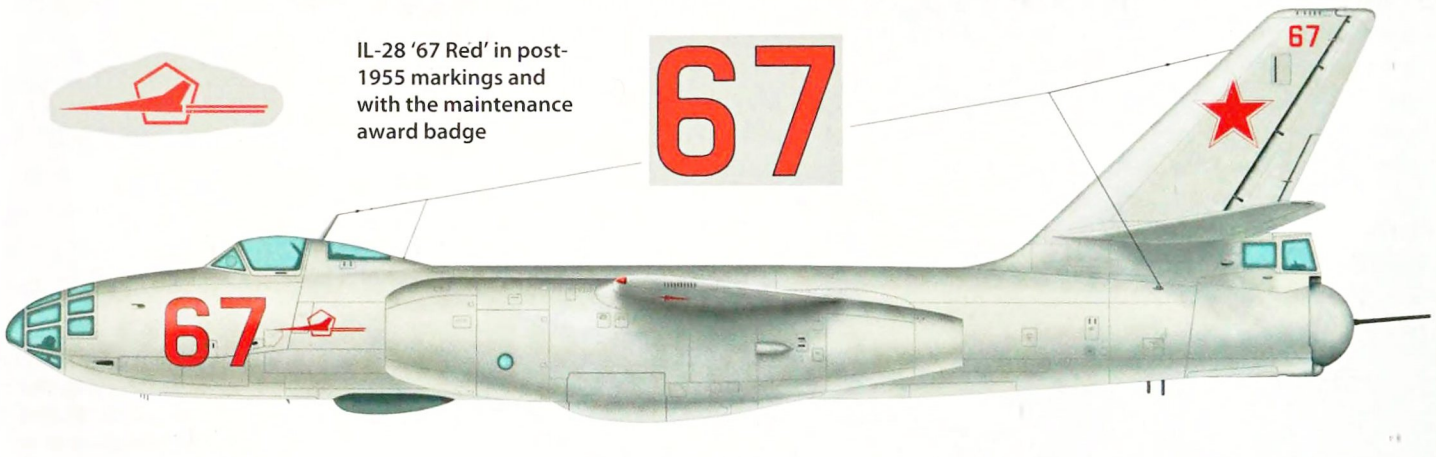
deadlines. On the other hand, failure to comply with the orders would result in disciplinary action.

Everybody racked their brains in search of a solution how to get all the aircraft in at once until, with a sly twinkle in his eye, one crew chief said he knew the answer. He would not tell it until he was assured of a reward in the form of a bottle of vodka. His method was simple: the technicians deflated the port mainwheel of each aircraft, causing the bomber to bank a few degrees – just enough to allow the port wing of one aircraft to fit under the starboard wing of another aircraft! This allowed all the bombers to fit into the hangar and the



The same aircraft in cruise flight. Note the DME aerials under the rear fuselage.

Another shot of the same IL-28U '85 Red' as it comes in to land.



IL-28 '67 Red' in post-1955 markings and with the maintenance award badge

updates to be made on schedule. Bless the technician, the Man of Infinite Resource and Sagacity!

On one occasion the 277th BAP was flying a live bombing practice sortie at the Litovko target range 50 km (31 miles) north of Khabarovsk during a tactical exercise. According to the scenario several flights of bombers attacked from different directions, each aircraft carrying two FAB-250 bombs. The weather was poor, with driving snow and a horizontal visibility of 3-4 km (1.86-2.5 miles). As one of the flights approached the range on a heading of 120° and the bomb bay doors were opened 10 km (6.21 miles) out, the right wingman's navigator watched the flight leader closely, waiting for the moment of bomb release (as he put it, *'I stuck my eyes into the leader's bomb bay'*). Suddenly a lump of snow fell out of the bomb bay (it must have built up during flight with the doors open), and the excited navigator hit the bomb release button right away. Realising his mistake, he dived for the ventral glazing panel to see where the bombs went; to his surprise, the aircraft were passing over one of the targets on the range and he watched the bombs explode 60 m (200 ft) from it! Next thing, the flight leader closed his bay doors *without* dropping the bombs and radioed that he had failed to spot the target because of poor visibility and was returning to base! The wingman pilot told his navigator to close the bay doors, saying the target run was off. Imagine his surprise when he heard the navigator say that the bombs were gone, and then the range controller report '060/120' (bomb deviation and heading respectively), meaning that they had almost achieved a direct hit. The pilot had had no time to watch the bomb indicator lights, concentrating entirely on formation keeping in the adverse weather. At the debriefing it turned out that this flight was the only one that had carried out the attack in spite of the poor visibility! Thus, it was a case of messing things up but – with a little luck – getting it right after all; this is why the crew was neither punished nor commended.

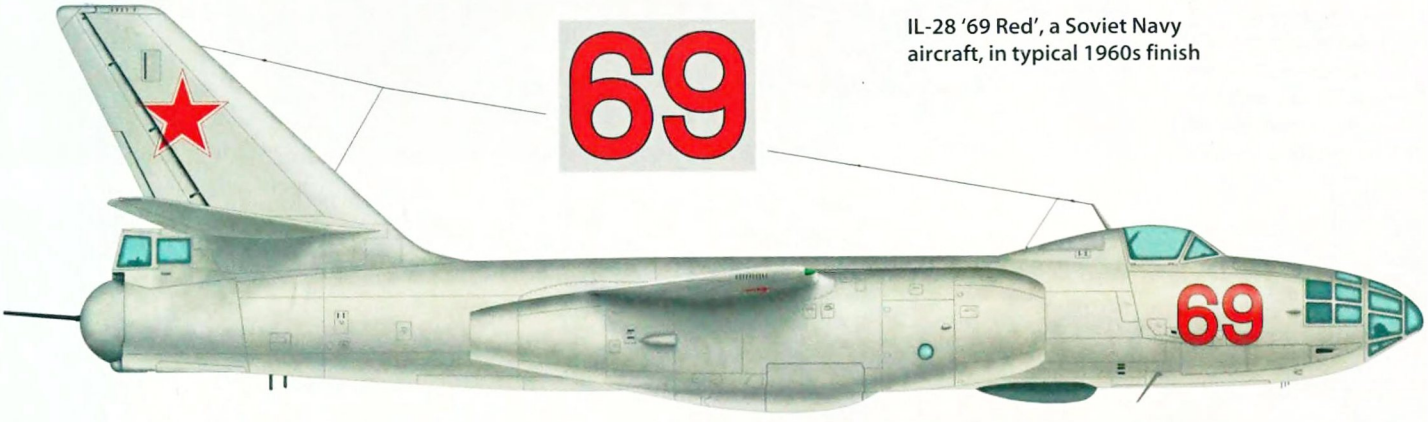
Two views of IL-28 '91 Red' fitted with wingtip ECM pods having dielectric front ends.

Interestingly, the IL-28 proved – albeit indirectly – to be the downfall of Vasiliy I. Stalin, the Soviet leader's younger son, who served in the Air Force. With that sort of lineage, he had risen in the ranks to Major-General and Commander of the Moscow MD's Air Force component at the age of 25. While being, by many accounts, quite a skilled pilot, Stalin Jr. was a whimsical person with a bad temper and had a drinking problem.

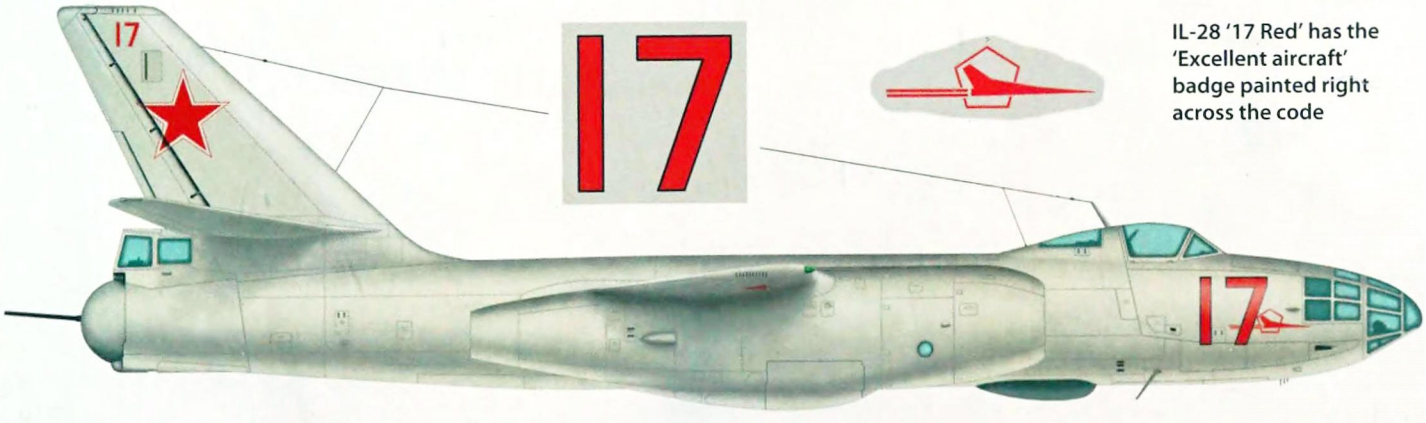
It so happened that Vasiliy I. Stalin was ex-*officio* in charge of all air displays and flypasts in the late 1940s/early 1950s – including the 1952 May Day parade in Moscow in which a large formation of combat aircraft (Tu-4s, IL-28s, MiG-15s) was to participate. The weather that day was absolutely prohibitive, with low clouds and

'100 Red', a very late production IL-28U with an unusually high tactical code

IL-28 '021 Red' which was an instructional airframe at the Achinsk Military Aviation Technical School

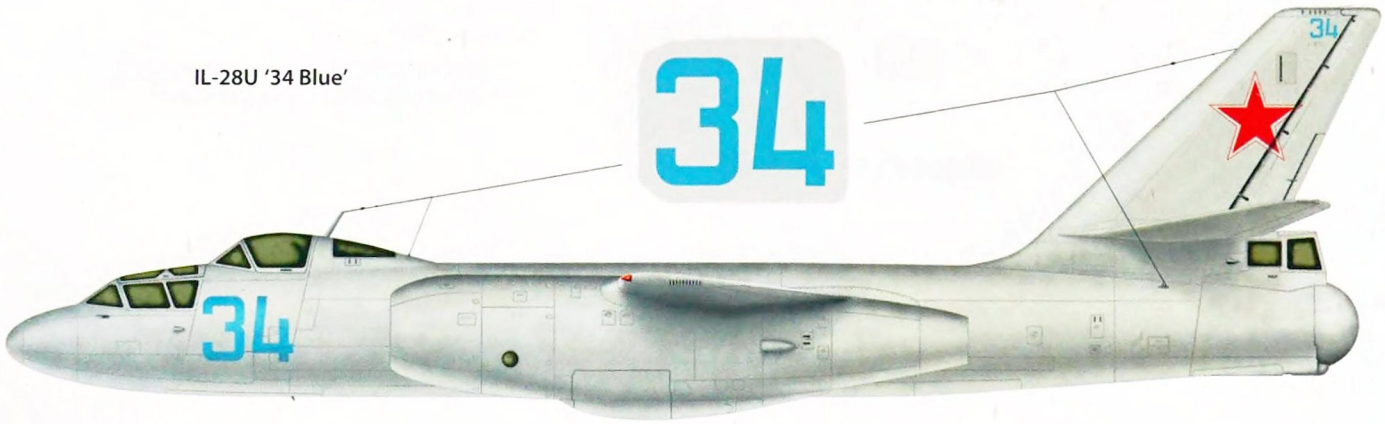


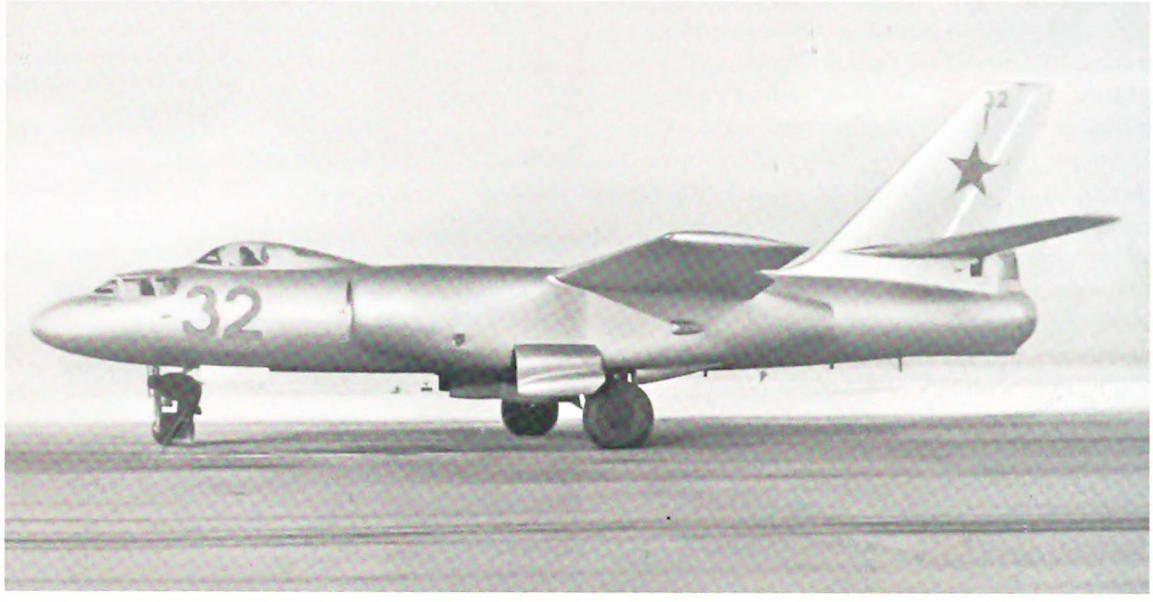
IL-28 '69 Red', a Soviet Navy aircraft, in typical 1960s finish



IL-28 '17 Red' has the 'Excellent aircraft' badge painted right across the code

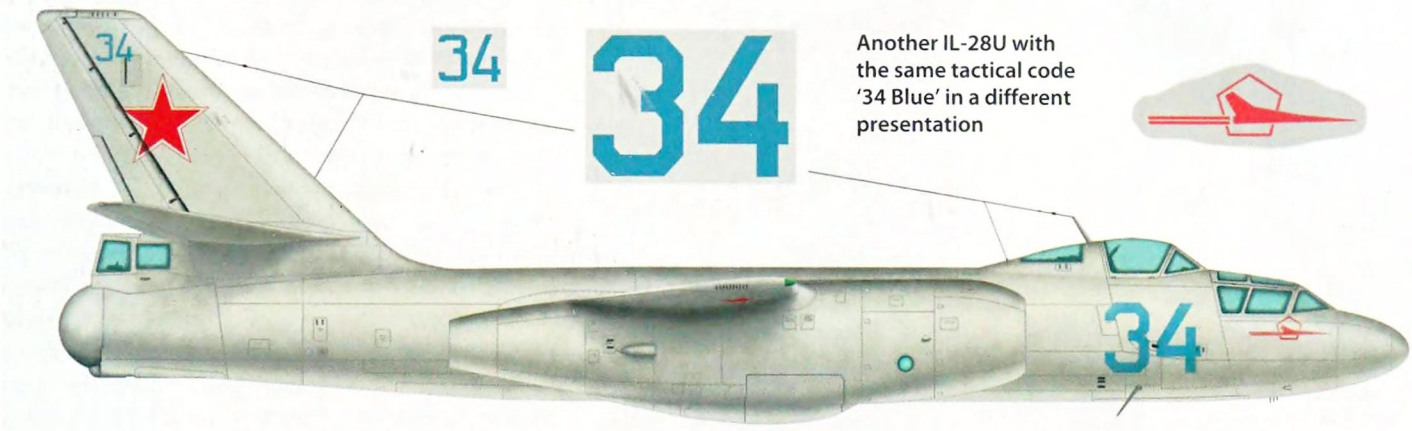
IL-28U '34 Blue'





Right: A technician examines the nose gear of IL-28U '32' at the 'last chance' checkpoint.

Below: This shot of a production IL-28U coded '99 Red' taxying out for take-off illustrates well the distinctive forward fuselage design with the stepped windscreen of the instructor's cockpit.



Another IL-28U with the same tactical code '34 Blue' in a different presentation

rain ('sky cleaner' aircraft supporting major public events were unheard-of in those days), and the situation at the airbases hosting the participating aircraft was no better. Air Force Commander-in-Chief Col.-Gen. Pavel F. Zhigarev cancelled the flying display, but Vasiliy Stalin gave him a phone call from his command post, requesting permission to undertake the flypast if the weather changed for the better. Zhigarev washed his hands of the affair, permitting him to act at his own discretion. As a result, without waiting for the weather to improve, Stalin took a risk and ordered all the participating units to take off and head for Moscow in instrument flying mode, he personally captained the Tu-4 that led the entire formation. That was a decision unprecedented in peacetime.

The result was deplorable. With no visual reference, some aircraft missed Red Square altogether; others flew across it instead of lengthwise, still others were ordered to abort the mission and return to base. The spectators did not see the flypast at all – they could only hear the roar of aircraft engines above the clouds, as the cloudbase was too low to descend below it. As a heavy bomber division of Tu-4s, with Vasiliy Stalin's aircraft in the lead, headed towards Red Square, a group of 56th BAD IL-28s led by the division CO Lt.-Gen. Sergey F. Dolgooshin came in from Migalovo AB. The jet bombers

The two IL-28s in the foreground – '26 Red' (c/n 55006424) and '27 Red' – are on quick-reaction alert (note ladders). The others are not, and are under wraps.

Maj.-Gen. Gheorgiy N. Zakharov who flew an IL-28 on a mission preparing the ground for Ice Station SP-4 in 1953.

were catching up with the Tu-4s, creating the danger of collision. Chief of the Main Command Post Col. B. A. Morozov ordered them to abort, directing the group towards Monino. As a result, the formation broke up; one IL-28 clipped the top of a tall pine tree at low altitude and brought home some twigs, another broke its pitot tube. Worst of all, two of the *Beagles* collided near Migalovo AB and crashed, killing the crews (according to some reports, only one bomber crashed, the other sustaining damage but landing safely).

The 'debriefing' conducted in the study of Minister of Defence Nikolay A. Bulganin ended in a slight fright for Vasiliy Stalin – he earned no more than a reprimand. However, at the reception held after the parade, in everybody's presence Iosif V. Stalin called Vasiliy 'a fool, a snotty kid' and so on. in very vivid expressions of which the Soviet leader was past master. Then he ordered Vasiliy to leave the study and instructed Zhigarev to dismiss him as Commander of the Moscow MD Air Force.

One more appearance of the *Beagle* over Red Square – also associated with Stalin – was due to anything but a festive event. On 9th March 1953 during the state funeral of Iosif V. Stalin, who had died four days earlier, a large formation of combat aircraft was to make a low flypast at 1210 hrs as a last tribute to the deceased leader. Yet the weather again threw a spanner in the works, with low cloud, rain and snow. Thanks to the de-icing system the IL-28 proved to be the only aircraft that was able to make the flypast, all other aircraft being barred from it due to the danger of icing.

At the beginning of 1953 an IL-28 made an unprecedented landing on the ice of the frozen River Kama right within the city limits of Perm'. This was not an emergency landing; the decommissioned aircraft was making its planned last flight to Perm' where it was to become an instructional airframe at the Naval Aviation Technical School (VMATU – *Voyen**no**-mor**sko**ye aviatsi**on**no-tekh**nich**eskoye oo**chil**ishche*), which had just begun training ground personnel for jet aircraft. To this end VMATU cadets prepared an *ad hoc* landing strip on the ice off Komsomol'skiy Prospekt avenue, 13.05 km (8.11 miles) downstream of the Kama Hydroelectric Power Station dam, where the river became more or less straight; it was 2 km (1.24 miles) long and 60 m (196 ft) wide. Perhaps this method was used because the school was right next to the strip, or someone had decided to check the possibility of operating the IL-28 from ice strips. No previous experience of such landings existed; still, the landing was a success, and later three more IL-28s (and three Tu-14Ts) landed in the same fashion. Later still, in May 1953, two IL-28s for VMATU arrived in a more traditional manner, landing at Perm'-Bol'shoye Savino airport.

In late 1953 a Soviet Air Force IL-28 flew an unusual and highly important long-range reconnaissance sortie in the Arctic Ocean. The objective was to find a suitable ice floe for Ice Station SP-4 (***Sev**ernyy **po**lyus* – North Pole), the fourth in a long series of Soviet drifting Arctic research stations. The aircraft was flown by Maj.-Gen. Gheorgiy N. Zakharov (HSU), with Vladimir P. Boolanov in the navigator's seat; this mission earned them the Order of the Red Star. Later, Boolanov was the chief navigator of the landing operation when the personnel and equipment of SP-4 were flown in by transport aircraft on 3rd April 1954; the station was commissioned on 8th April.

In 1972 a 98th GvORAP IL-28R was called upon to assist in the search for the wreckage of a Kuibyshev-built IL-2 attack aircraft (c/n 1872932) which had flown with the 828th ShAP (*shtoormo**voy** **avia**polk* – Attack Air Regiment) and had been shot down near Lake Orijärvi in Karelia on 10th March 1943. Although the whereabouts of the wreckage was known fairly well, the crew failed to locate it. Eventually the IL-2 was located and recovered by a different search party for later restoration and preservation in Samara.

Major repairs and refurbishment of the IL-28 was done by the manufacturing plants until 1961. Considering that a large number of Soviet Air Force *Beagles* were still active in 1965, refurbishment resumed that year at the MoD's aircraft repair plants (ARZ – ***avia**remont**nyy** za**vod***). The IL-28 was handled by the 123rd ARZ in Staraya Roossa (Novgorod Region), the 150th ARZ in Lyublino (Kaliningrad Region), the 358th ARZ in Omsk, the 360th ARZ in Ryazan' (Dyagilevo AB) and the 712th ARZ at Chelyabinsk-Shagol AB.

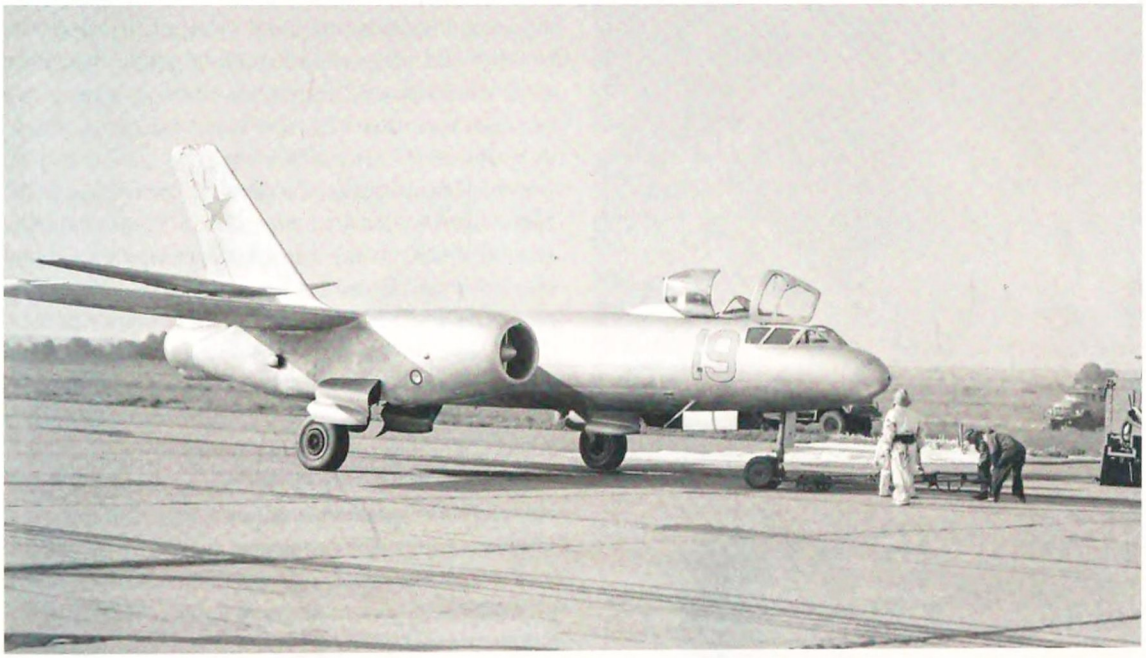
An IL-28U escorted by a pair of MiG-19P all-weather interceptors participates in an air parade.

The nuclear experience

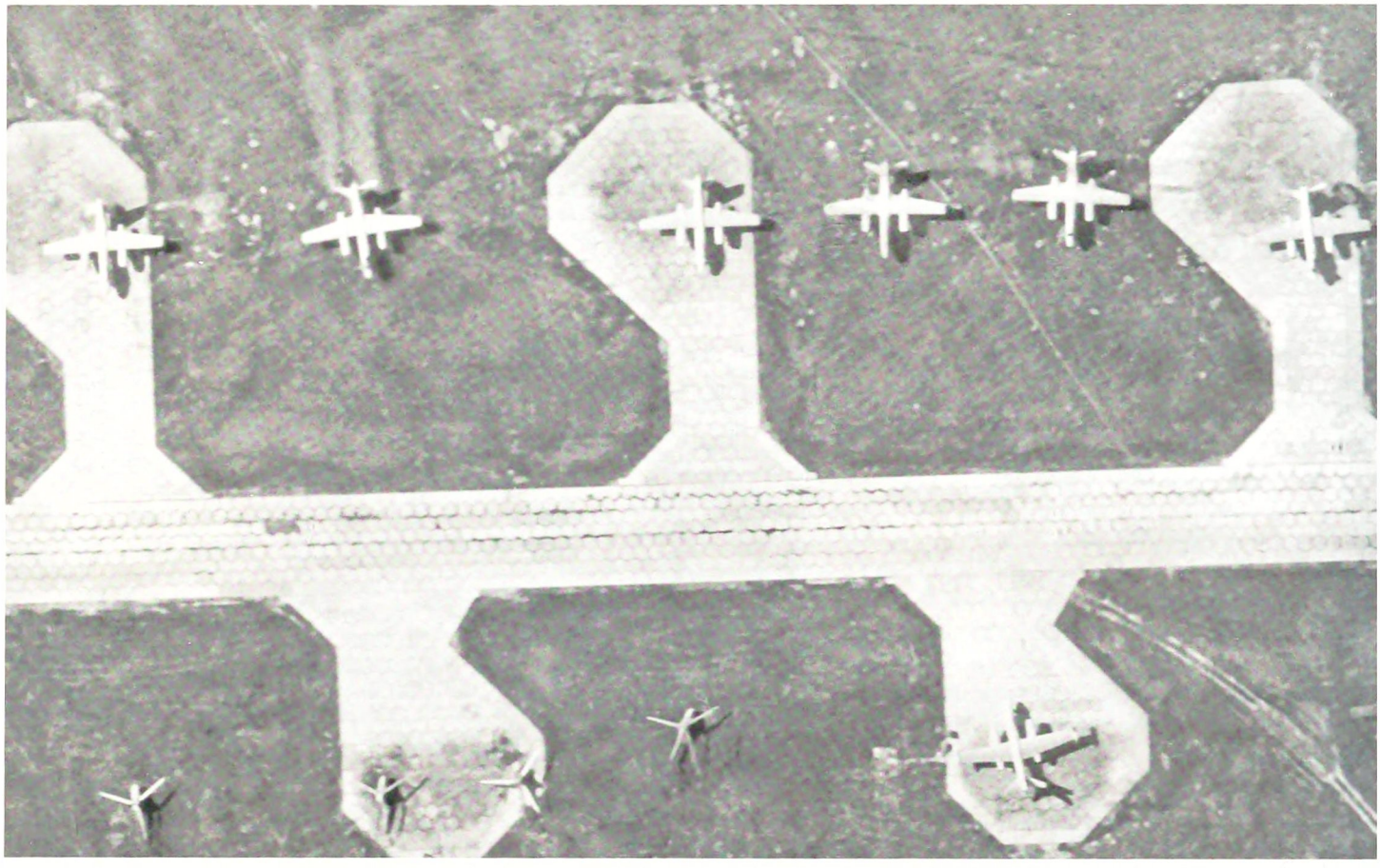
The IL-28 contributed a lot to the development of Soviet free-fall nuclear weapons. As already mentioned, the *Beagle* was used for testing the RDS-4 Tat'yana nuclear bomb which then became the standard weapon of the IL-28N and, later, its supersonic successor – the Yak-28 *Brewer*. The tests took place at the proving ground built for this purpose 170 km (105 miles) west of Semipalatinsk and known as the War Ministry's Practice Range No.2 (UP-2 – *oo**cheb**nyy poli**gon***).

Here it should be mentioned that an outfit called the Air Force's 71st Test Range had been established at Bagerovo in the eastern part of the Crimea Peninsula, 14 km (8.7 miles) west of the city of Kerch, pursuant to a Council of Ministers directive issued on 21st August 1947. Its function was to conduct aerial nuclear tests and test the nuclear munitions' delivery vehicles – that is, bombers because no nuclear-tipped ballistic missiles existed yet. It was to be commissioned in the summer of 1949, when the first Soviet nuclear test was to take place; this was a major effort and included complete reconstruction of the wartime auxiliary airfield at Bagerovo, which was in a state of total disrepair.

Actually the designation '71st Test Range' was something of a misnomer. In reality this was a test and support establishment which, in addition to an instrumented target range, included three Air Force units. They were the 35th OSBAP (*ot**del'**nyy **smesh**annyy bombardi**rov**ochnyy **a**via**polk*** – Independent Composite Bomber Regiment) equipped with Tu-4s (and later with jet bombers and fighter-bombers), the 513th IAP (*istre**bit**el'nyy **a**via**polk*** – Fighter Regiment) equipped with Lavochkin La-9 *Fang* piston-engined fighters and MiG-17 jet fighters, and the aforementioned 647th SAPSO. The latter operated a mixed bag of aircraft which changed over time – Po-2



Here, IL-28U '19 Blue' serves as a prop for a firefighting exercise (which does not involve setting fire to the aircraft).



Above: IL-28s (including an IL-28R in the lower right-hand corner) and Mil' Mi-1 light utility helicopters at the dispersal area of a Soviet airbase. The photo was taken by a Soviet reconnaissance aircraft (probably the Yak-25R prototype undergoing trials).

Conversely, this photo showing IL-28s, Su-7Bs and MiG-17s was taken by a western reconnaissance aircraft on a mission.

light utility biplanes, Yakovlev Yak-12 *Creek* light utility monoplanes, Li-2, IL-14, Antonov An-8 *Camp* and An-12 transports, An-24 *Coke* airliners, Yak-25RRV *Mandrake* and IL-28R reconnaissance aircraft, Mil' Mi-6 *Hook* heavy-lift helicopters. It was tasked with air sampling in the wake of nuclear tests, aerial photography, transport and liaison duties. Only instrumented inert bombs were dropped at Bagerovo for the purpose of checking their ballistics and testing the fuses; nobody in their right mind would test a live nuclear bomb in the Crimea which was, to use a common Soviet-era cliché, *the all-Union resort*!

On 12th August 1953 two 647th SAPSO IL-28s operating from Zhana-Semey AB in Kazakhstan (the nearest airfield to the Semipalatinsk Proving Ground that was regularly used in support of the nuclear tests) monitored the test of the world's first hydrogen bomb – the 400-kiloton RDS-6S implosion-type bomb. This was performed under the guidance of Academician Igor' V. Kurchatov (head of the Nuclear Physics Institute, the Soviet counterpart of Samuel Cohen).

A case is on record when the *Beagle* actually operated in a nuclear environment. On 14th September 1954 the Soviet Union held the first all-arms exercise involving actual use of nuclear weapons for the purpose of training the troops to operate in a nuclear environment. This was not an unprecedented event;

military exercises involving live nuclear weapons were held both before and after it. Specifically, the USA had held Operation *Buster-Jangle* in 1951 (a series of seven tests with yields ranging from 1.2 to 31 kilotons at the Nevada Proving Ground between 22nd October and 29th November) and Operation *Upshot-Knothole* in 1953 (eleven tests ranging from 0.2 to 61 kt at the same location between 17th February and 4th June). Later, France held the 5-kt test *Gerboise Rouge* (Red Jerboa) on 27th December 1960 and the 1-kt test *Gerboise Verte* (Green Jerboa) on 25th April 1961 in the Algerian Sahara desert.

Exercise *Sne**zhok*** (Snowball) took place at the artillery range in Totskoye (Orenburg Region) in the south of the Urals Mountains. The location was chosen because the terrain there resembles the typical terrain of Western Europe – according to Soviet military theoreticians, the most likely place for the Third World War to begin. The three purposes of the exercise were: to test the effects of a nuclear blast on a fortified line of defence, as well as on military materiel and on animals; to verify a possible scenario of an offensive by own troops in direct contact with the adversary without withdrawing them from the line of contact before the nuclear strike; and to teach the personnel (enlisted men as well as commanders) how to conduct offensive and defensive operations in a nuclear scenario.

According to the plan, the target replicated exactly the defensive positions of a US Army battalion. The nuclear bombardment would be followed by an attack by strike aircraft and finally a ground assault by a mechanised infantry regiment. The exercise involved a total of 45,000 servicemen, 600 tanks and self-propelled guns, 500 artillery pieces, 600 armoured personnel carriers, 320 assorted aircraft and 6,000 automobiles. In particular, three regiments of IL-28s (the entire 140th BAD) were involved, redeploying to forward bases in the Orenburg Region for the occasion.

A huge amount of fortifications was built at the Totskoye range – 383 km (238 miles) of trenches, 394 pillboxes, 140 light shelters etc. These measures were an absolute necessity, as the participating troops – both Red Force and Blue Force – would be just 5 km (3.1 miles) from the hypocentre of the explosion. (In Soviet/Russian exercises, Red Force is the 'good guys' and Blue Force is the 'bad guys'; in NATO exercises it is vice versa.)

Exercise *Snezhok* was commanded by Marshal Gheorgiy K. Zhookov of Great Patriotic War fame, the Commander of the Soviet Army's Ground Forces; however, he was present only at the 'dress rehearsal' (without nukes), not at the actual exercise. The entire Soviet top military establishment (the commanders of all armed services, Military Districts and Air Defence Districts) and the invited ministers of defence of 'friendly nations' watched from a command post located 2 km (1.24 miles) from the 'adversary's first line of defence'.

Originally the then-latest Tu-16A nuclear-capable bomber was to perform the drop. However, the *Badger-A* showed disappointing results (during practice runs the dummy bombs missed the target by as much as 700 m/3,000 ft), endangering the invited guests who could be caught by the blast. Hence the proven Tu-4A nuclear-capable bomber offering greater accuracy was chosen for the mission. At 0934 hrs Moscow time on 14th September a 35th OSBAP Tu-4A captained by Lt.-Col. Vasiliy Ya. Kutyrchev, which had flown in from Vladimirovka AB, a GK NII VVS facility in Akhtoobinsk (Astrakhan' Region) located some 900 km (559 miles) away, dropped a 40-kt RDS-3 nuclear bomb (some sources say a 38-kt RDS-2) from 8,000 m (26,250 ft) – the minimum altitude at which the bomber could escape the blast wave. 48 seconds later the bomb exploded at the stipulated height of 350 m (1,150 ft) above ground level. Two IL-28Rs accompanied the bomber, photographing the moment of release and the explosion itself.

The nuclear blast was followed five minutes later by a 25-minute artillery attack on Blue Force positions, next, the three regiments of IL-28s came in, escorted by MiG-15 jet fighters from the 165th IAP, to flatten whatever targets were left with conventional bombs. The pilots were issued special goggles to protect their eyes from the flash of the explosion. When the nuke went off, creating the tell-tale mushroom cloud, most aircraft managed to steer clear, but some of them flew right through the pillar of the mushroom cloud.

This is how Mikhail P. Kremeshnyy, the navigator of an IL-28 flown by Capt. Mikhail P. Klyuchkin, described the event. *'On 27th June all regiments in our division redeployed to airfields in the Orenburg Region. The bombers flew singly at high altitude, making a refuelling stop in Voronezh. Our regiment took up residence at Cheben'ki airfield which had a dirt strip covered with perforated steel planking (PSP). There the preparations for the exercise became even more intensive.*

Most of the flying was group ops in flights, squadron, regiment or full division strength. All the pilots and navigators in each unit were involved. Each regiment had three groups of nine [experienced pilots], plus a group of seven young pilots. Our crew was the lead aircraft of the left-hand flight in group 2; group 1 was led by the regiment CO. [...]

"Day X" (the day of the Xercise – *Auth.*) *came at last – a historic day and, for many, the day of doom.* (Kremeshnyy refers to the fact that many participants of Exercise *Snezhok* were exposed to high amounts of ionising radiation and subsequently died of acute radiation syndrome – *Auth.*) *It was 14th September 1954. None of us felt any particular trepidations – it was pretty much the same as during the practice sessions. We took off*

The navigator of an IL-28 at his workstation with the bomb sight swung into position.

Opposite page, top: The ground crew examines the port VK-1 engine of an IL-28 with the forward cowling section removed.

Opposite page, bottom: Technicians at work on the accessory gearbox of the starboard engine showing the GSR-9000 generator (foremost), the AK-150 compressor (on top) and the fuel pump.

Here the navigator is seen doing the other part of his job, using the map table for plotting the aircraft's course.

on schedule and assumed combat formation in flights, squadrons, regiments and full division strength. Over the radio we heard that the aircraft carrying the nuclear bomb was already on its way, ahead of our division. It was to drop the bomb, whereupon we were to pass through the mushroom cloud and drop our bombs on our assigned targets which were to the left of the explosion's epicentre (*sic*; actually hypocentre – *Auth.*). *Our bombs were of a new model and were thus being tested during this sortie. We knew the exact time when the nuke was supposed to go off. "Don the goggles" – the command went out over the radio; before the sortie we had all been issued dark goggles to prevent us from being blinded by the flash of the explosion.*

As we approached the Totskoye target range we saw that it was completely obscured by overcast. This had prevented the crew of the nuclear-armed bomber from dropping the bomb on the first try; now it was circling, trying to make a repeat pass. And so did our entire division, following it. In spite of all the training, we were now all tense as hell. Again the command "Don the goggles" came over the radio. We could hear other commands within our groups of bombers, but as we began the target approach the radio fell silent.

And then it happened! We saw a sight that only the gods could see – the explosion of a nuclear bomb. The power of the flash was incredible, like a welding arc right in front of you on a dark night. Then a huge fireball billowed up, gradually losing its brightness and rising higher to form the distinctive mushroom cloud. The mushroom kept growing, sucking up a pillar of broiling red dust.

As we approached our targets the wind blew the mushroom cloud off to the south, towards the trenches and foxholes that had been dug in advance. "Close the shutters!" – came a new command (the shutters in the ram-air ventilation system – *Auth.*). *The lead groups of bombers were already disappearing into the cloud. I watched how the other crews were taking it; they coped well, keeping formation unflinchingly.*

Now it was our group's turn to enter the radioactive cloud. Our bomber shuddered as it passed through the pillar of the mushroom. As soon as we broke clear of the cloud, it was "bombs away". Afterwards we learned that we had scored a bull's eye, earning top grades for the bombing run. When we returned to base and landed normally, for a while the ground crews were afraid to approach the bombers; the aircraft were covered all over in some brown stuff. The radiologists measured the radiation levels, and these figures immediately became top secret; we never learned how much radiation we had been exposed to.

We climbed out, took a shower and went off to have lunch. After an hour's rest we were ordered to line up, and the regiment CO announced (in the presence of officers from the exercise's command group) that it was necessary to determine the exact location of the nuclear blast's epicentre in low-level flight.

"Any volunteers?" – he asked. My pilot Capt. Klyuchkin gave me an eloquent look; I got the message and said: "Let's go". We stepped out of line; two other crews followed our example. Yet the commanders decided to entrust our crew with the mission. Minutes later we were airborne again. As we approached the target range at low altitude I was the first to see the dreadful aftermath of the nuclear blast. I let loose a ripple of signal flares, allowing the ground personnel to pinpoint the epicentre, and looked again at the churned-up, scorched earth and the devastated fortifications that had been purpose-built for the exercise.

After landing the ground crew was reluctant to approach our aircraft for a long time. I had to jump down on the hardstand because no ladder had been erected for me, and then demand that a ladder be brought for the pilot. Straight away we were taken to a medical facility for an examination, including a radiation check. However, we were never told the results.

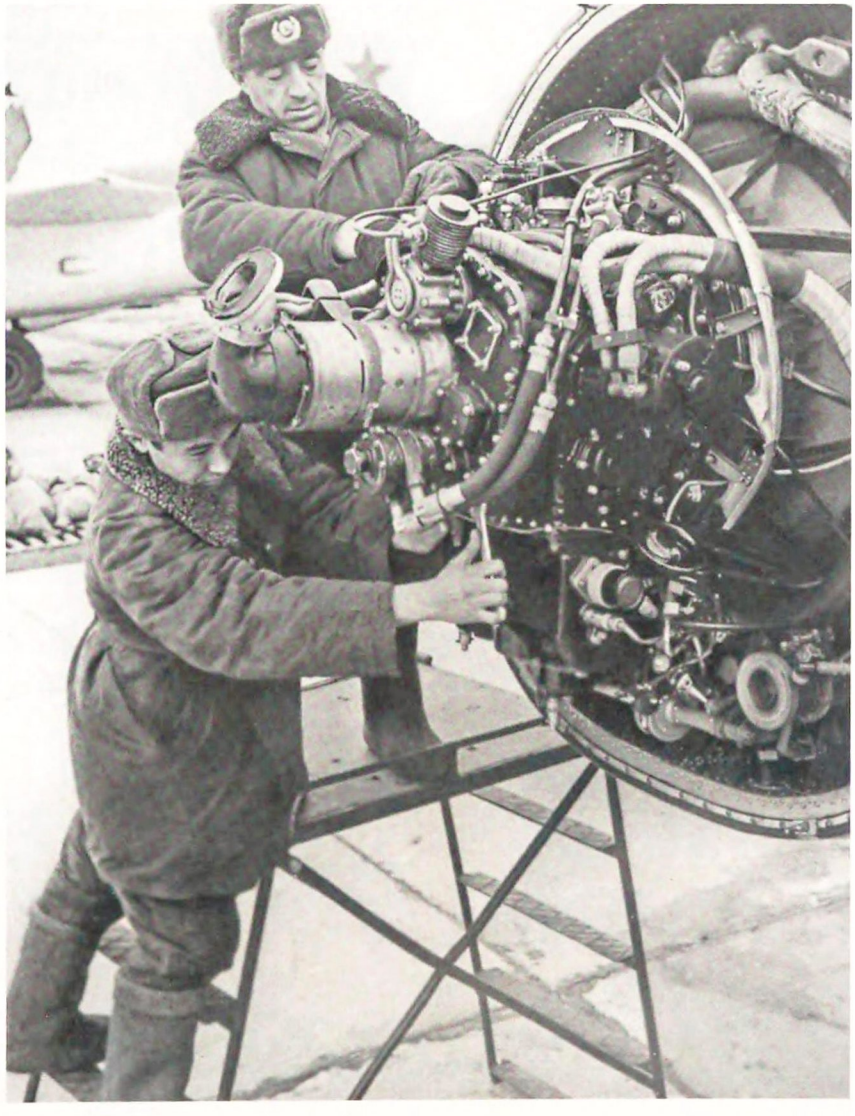
Afterwards, at the regimental line-up, the CO announced that we had received a commendation from Minister of Defence Marshal Gheorgiy K. Zhookov.'

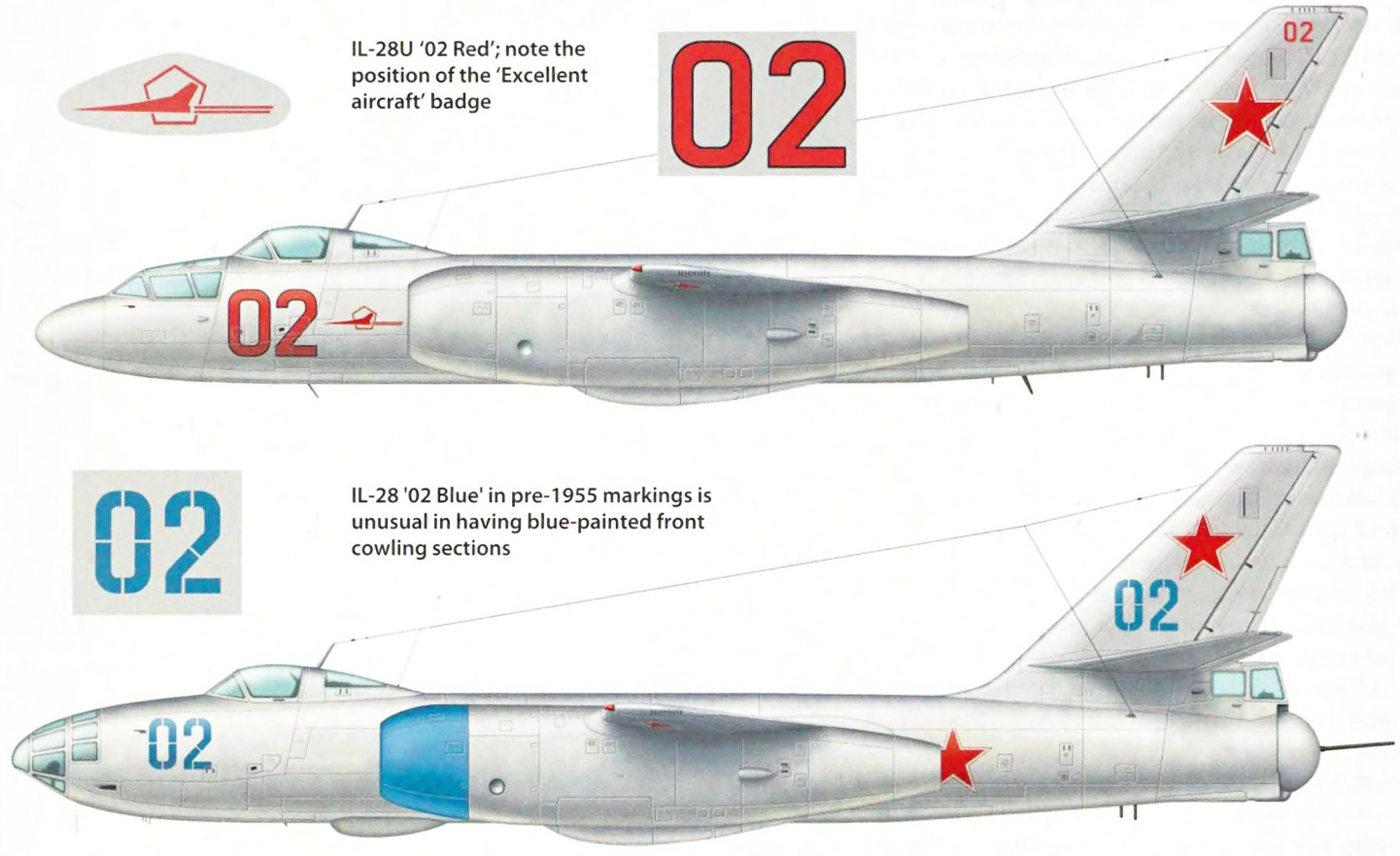
Scouts sent into the area immediately after the *Beagles'* bombing attack reached the hypocentre 40 minutes after the blast. They established that the radiation level there one hour after the explosion was 50 roentgen/hour, decreasing to 25 R/h at 300 m (990 ft) from the hypocentre, 0.5 R/h at 500 m (1,640 ft) and 0.1 R/h at 850 m (2,790 ft). Finally, at 1010 hrs a mechanised infantry assault began. According to some sources, the Red Force personnel advancing through the contaminated zone was issued full nuclear, biological and chemical (NBC) protection suits; other sources say they had only gas masks.

The 71st Test Range tested not only all-new types of bombs but operational ones as well. At first the Air Force had no 'nuclear armourers' of its own, and teams of specialists for routine handling and maintenance of the nukes were supplied by the KB-11 design bureau of the Soviet Academy of Sciences' Laboratory No.2 in the town of Sarov (Gor'kiy Region, now Nizhniy Novgorod Region). Final assembly of the bombs in ready-to-use (so-called Stage 5) configuration and hooking up could only be done with written authorisation from KB-11 chief Lt.-Gen. Pavel M. Zernov, who was vice-chief of MSM. Engineer P. Mesnyankin, who was on one of these teams, recalled the following episode:

'We kept a 24/7 vigil at the site where the "special stores" were assembled. Our knowledge of the final assembly manual was checked daily. The nuclear bombs were always at the ready, and IL-28s with the deadly weapons in their bomb bays were ready to depart on a mission any time. Night practice alerts were sounded once a week. Initially the flight crews had to wait for us to finish the preparations, but presently we learned to keep up with them and occasionally even "won the race". [...]

Once when I was on duty [at the site] Air Marshal Vladimir A. Soodets wished to have a talk with us. At the end of the conversation he asked us a difficult question: "What if the aircraft has to make a belly landing?" (What he meant was 'Will the nuclear bomb explode in the event of a crash landing?' – *Auth.*) *We did not know the answer to that one yet. At the Marshal's orders we urgently prepared a special programme to test the bomb for resistance against accidental detonation. The tests were held at the 71st Test Range near Kerch; the range and its airfield at Bagerovo were commanded by Lt.-Gen. Viktor A. Chernorez. In the summer of 1955 a test panel consisting of*





IL-28U '02 Red'; note the position of the 'Excellent aircraft' badge

IL-28 '02 Blue' in pre-1955 markings is unusual in having blue-painted front cowling sections

A mechanic opens an access hatch on the starboard tip tank of an IL-28R

[KB-11] gas dynamics section chief Boris N. Ledenev, Engineer-Colonel V. I. Kapoostin and myself (representing the production plant) arrived in Simferopol' by plane from Sarov. Three "Tat'yana" nuclear bombs [...] with production-standard detonators installed (and with the explosive charge used for compressing the uranium installed, but no fissionable material – *Auth.*) *had been delivered to the test range by then. The bombs were dropped from an aircraft flying at 1,000 m [3,280 ft] onto earth of differing hardness.*

The first bomb, which fell on shell rock, did not explode, and after waiting for 15 minutes we walked up and examined it. One careless move could provoke an explosion, so we only did a visual check. [...] The detonators were intact, showing no visible damage. Removing them was too dangerous [...] and the bomb was detonated by the range's specialists. It was the same story with the other two bombs, which were dropped on harder rock. The main result was obvious – the detonators filled with lead azide had not exploded or suffered damage. Now we could answer the Marshal's question – a belly landing [with a nuke on board] would not provoke a nuclear explosion.'

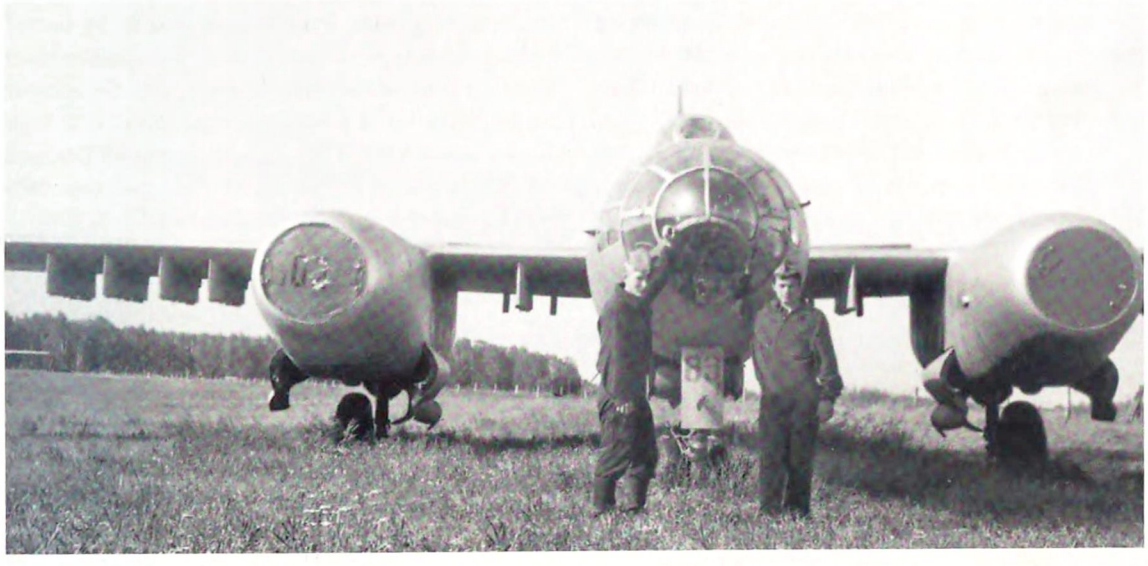
The IL-28Ns armed with nuclear bombs were placed on maximum alert more than once. The first such case was in 1955 when Soviet-US confrontation had one of its peaks. Being aware of the US administration's plans of a massive nuclear strike against the Soviet Union's key military, industrial and political centres, the Soviet government was preparing for retaliatory action on the double. In particular, knowing that the Ukrainian cities of Zaporozhye and Dnepropetrovsk were among those to be targeted and that the USAF had deployed two

squadrons of nuclear-capable bombers to Turkey, the Soviet government dispatched a task force with two nukes to Zaporozhye. From there a nuclear strike was to be delivered against Incirlik airbase at Adana where the bombers were, with Istanbul airport as the alternate target. Three IL-28Ns were prepared; the crews received special training. For security reasons a tent was erected around each aircraft to conceal it from the casual observer, and the aircraft were guarded by sentries. If the strike would indeed be carried out, this would be a one-way mission for the *Beagle* crews. Fortunately the order to launch never came.

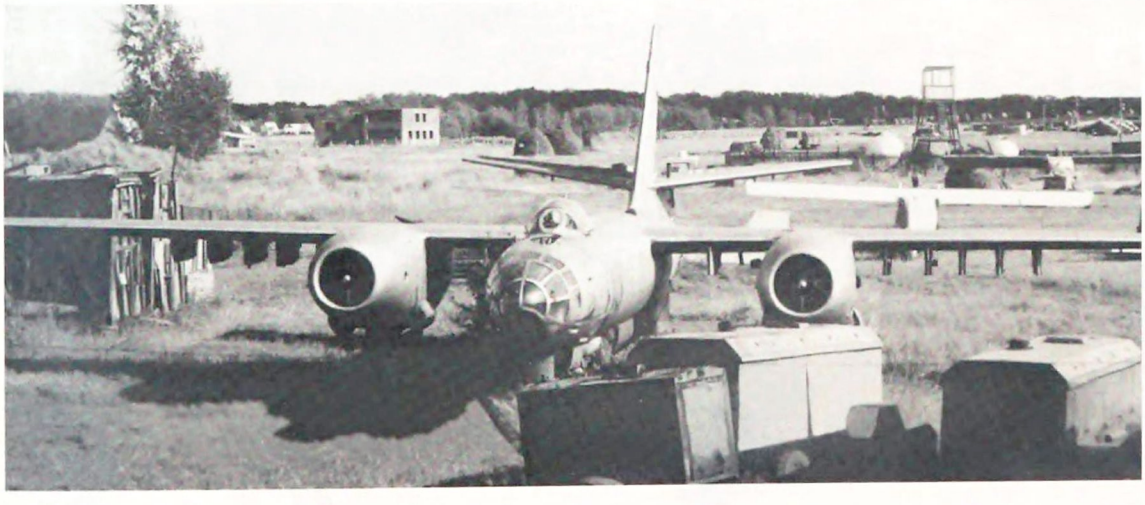
* * *

As early as the mid-1950s the IL-28's fortunes suffered a downturn. Firstly, supersonic aircraft with much higher performance were being developed, making the subsonic *Beagle* appear obsolete. Secondly, in the late 1950s Nikita S. Khrushchov began a military reform that mostly boiled down to far-reaching arms reductions – a total of 1.2 million men were dismissed from the Armed Forces without any social security, generating a lot of resentment and adding to the

An IL-28U displays its wing shape as it passes overhead.



IL-28Sh '83 Red' ended up in a tech school after being retired from active duty.



This fully intact IL-28Sh was at a military training centre in Novosibirsk.

sentiment that eventually led to Khrushchov being deposed in 1964. Thirdly, there was Khrushchov's notorious 'missile itch' – the Soviet leader did not believe in manned combat aircraft, preferring missile systems of various classes.

As a result, the decision to reorganise a number of Soviet Air Force units into missile units armed with ballistic missiles bit a good-sized chunk off the Soviet combat aircraft fleet. As of July 1959 the FA had only 25 bomber divisions left, comprising 85 bomber regiments. The plans to re-equip the tactical bomber units with qualitatively new aircraft had to be shelved for the time being. Only one available tactical bomber met the Air Force's requirements; it was the Yak-28, a direct descendant of the Yak-26 *Flashlight-B* supersonic bomber prototype (which in turn was a derivative of the Yak-25 subsonic interceptor). Yet, the Soviet Air Force top brass had no illusions about it. In February 1959, speaking at a session of the USSR's Military Council, Marshal Rodion Ya. Malinovskiy (who had superseded the deposed Marshal Gheorgiy K. Zhookov as Defence Minister) said: *'...The situation with bombers is really dire. This is especially true for tactical bombers. We are currently operating the IL-28, which has outlived its useful life. Yet there is no replacement available. We aim to take delivery of a new tactical bomber, the so-called (sic – Auth.) Yak-28, in the next few years, but this is not what we want...'*

In the early 1960s numerous Tactical Aviation units were disbanded. Lots of IL-28s, some of which had only 60-100 hours' total time since new, were wantonly destroyed at the orders of the higher command. This barbaric process went at an amazing rate, the work proceeding in three shifts; some unit commanders carried out these orders with such zeal that aircraft were run over and crushed by tanks right on the flight lines in order to meet deadlines. *Carthago delenda est!*

Fortunately the VVS command was not enthusiastic about this mayhem, and many IL-28s were simply placed in storage. Numerous *Beagles* were transferred to flying schools where they served alongside the IL-28U trainers until the mid-1980s. For example, the TVVAUL replaced its IL-28s with Tu-134UBL *Crusty-B* bomber pilot trainers in 1986.

Other IL-28s soldiered on as target tugs, also until the mid-1980s. Nearly all of the Soviet Union's military districts had independent target-towing flights (OBAZ – *ot**del'**noye books**irov**ochnoye **a**viazve**no***) or squadrons operating four to ten, and sometimes more, IL-28s. These were based at Novorossiya AB (Far East MD), Berdyansk (Odessa MD), Starokonstantinov (Carpathian MD), Tokmak (Central Asian MD, 10th OBAZ) etc.

Moreover, the IL-28 got a new lease of life (if only briefly) in the late 1960s and early 1970s when the post-Khruschchov Soviet government headed by Leonid I. Brezhnev decided to revive the ground attack arm of the VVS (which was one of the hardest hit by Khruschchov's reforms). A contributing factor was the deterioration of Sino-Soviet relations which culminated in an armed conflict in 1969 when China attempted to seize several islands on the Ussuri River marking the Sino-Soviet border. A number of *Beagles* were converted to IL-28Sh ground attack aircraft. Up to a full regiment of these aircraft was based at Domna AB (Transbaikalian MD) and Komsomol'sk-on-Amur/Khoorba AB (Far East MD) – the 733rd BAP and 277th BAP respectively.

The last operational use for many IL-28s was that of a target drone. IL-28M radio-controlled drones were used a lot for training SAM system crews.

A Naval Aviation *Beagle* (probably an IL-28T) with the unusually high serial '100 Red'.

In Navy service

The Naval Aviation started receiving the IL-28 in the summer of 1951, initially in basic bomber configuration. The introduction of combat jets coincided with a severe escalation of international tension ignited by the Korean War. The outbreak of this war put an end to post-World War II arms reductions. The Soviet anti-shipping force started growing rapidly due to both formation of new units and the transfer of complete bomber regiments from the Air Force to the Navy; soon the AVMF had up to 20 torpedo-bomber units.

The Soviet Navy's association with the *Beagle* began on 21st April 1951 when Minister of Defence (or, to be precise, Minister of War, as he was then called) Marshal Aleksandr M. Vasilevskiy issued order No.0188 setting the schedule for re-equipment of the Naval Aviation (then known as AVMS – *Avi**ah**tsiya Voy**en**no-mor**skikh** seel*) with the latest Tu-14T and IL-28T twinjets. By 1953 the regiments flying wartime IL-4T, Douglas A-20G Boston and Tu-2/Tu-2T torpedo-bombers had converted completely to the new hardware. Here the *Beagle* had an important advantage over the *Bosun* – unlike the Tu-14, it had a trainer version.

Here, again, it is worth quoting a comment by Timofey P. Poonyov: *'The IL-28 is a very good aircraft, and I have had an opportunity to compare it with its "analogue". One day we landed at Saki* (Novofyodorovka AB – *Auth.*) *during an exercise [...]. Naval Aviation pilots operated from that base, and we shared the base for the duration. They were flying the Tu-14. In my opinion, the Tu-14 is an ugly aircraft. It looks incongruous – none of the parts seem to fit together. The wings were awkwardly mated with the fuselage; as for the [vertical] tail, it looked like something straight off the [Boeing] B-17. You got the impression that someone had taken a piston-engined aircraft and tried to stick jet engines on it. [...] The Tu-14 flew exactly as it looked – awfully. I (and the other airmen in our unit) always had the impression that the Tu-14*

Top: Soviet Navy IL-28s on the flight line; the dress whites of some of the officers show this to be a naval unit. The serials have been retouched away by the military censor.

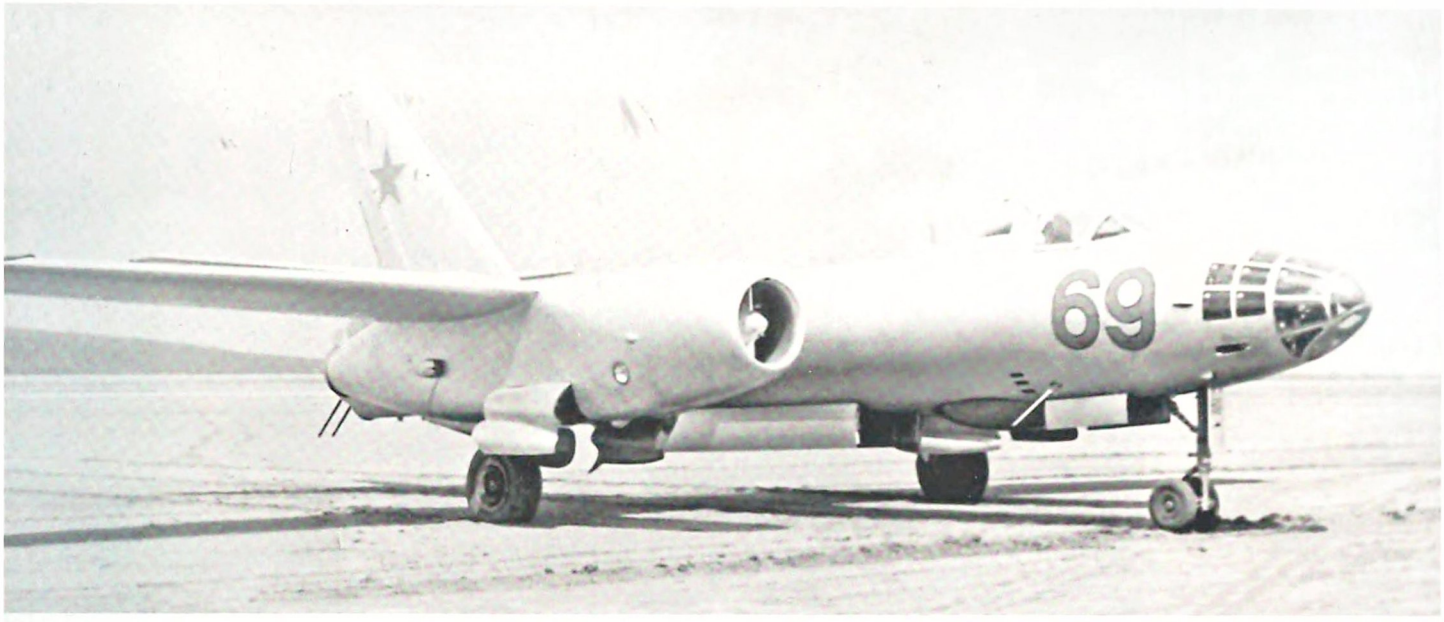
Above: '10 Red', an IL-28 operated by a Naval Aviation unit, taxies out past a sister ship standing at the ready with starter cart attached.

A Naval Air Arm instructor shows an IL-28U's cockpit to a seaman technician; another seaman is making some adjustments to the nose gear unit.

would run out of runway before it could take off. It would begin the take-off run from the very threshold, lumbering along, the engines roaring as it ran, and ran, and ran... When we saw this for the first time we were sure that it would end up in the drink. The naval pilots used choice language when talking about this aircraft... it couldn't hold a candle to the IL-28.'

On the **Baltic Sea**, the first unit to convert – and the first-ever naval *Beagle* unit at large – was the 1531st GvMTAP (*Gvar**dey**skiy **min**no-tor**ped**nyy **avia**polk* – Guards Minelayer & Torpedo-Bomber Regiment) of the 8th VMF, which completed its transition in August 1951. The Baltic Fleet's 51st MTAP apparently also operated the IL-28 until it was disbanded. Later, in 1961, the

The aircrews (in dress whites) and ground crews of a Black Sea Fleet IL-28 regiment pose with one of the unit's bombers at Kirovskoye AB.



An apparently retired AVMF IL-28 sitting on the grass with the cannons drooped and the bomb bay doors left open (which is not normally the case).

759th MTAP flying the IL-28 was established at Khrabrovo airfield (Kaliningrad Region; now the airport of Kaliningrad) as part of the 384th (formerly 8th) ***Gat****chinskaya* MTAD (***min****no-tor****ped****naya* ***a****viadi****vee****ziya* – Minelayer & Torpedo-Bomber Division) headquartered at Riga, Latvia, inheriting the combat awards of the defunct 51st Regiment. The division's honorary appellation had been given for its part in liberating the town of Gatchina (Leningrad Region).

(Note: On 25th February 1946 the Baltic Fleet was split into two operational/strategic formations – the North Baltic and South Baltic Fleets with headquarters at Tallinn and Baltiysk respectively, each with its own aviation component; these became the 4th and 8th VMF respectively in January 1947. The Pacific Fleet followed suit in January 1947, splitting into the 5th and 7th VMFs. Thus, for a while the Russian acronym VMF (*Vo****yen****no-mor****skoy*** *flot* – lit. 'military seagoing fleet') came to denote a major formation *within the Navy structure*, not the Navy as a whole. In the mid-1950s the Ministry of Defence came to the conclusion that splitting the Soviet Navy's fleets into smaller entities was inexpedient, and the process was reversed. In April 1955 the 5th and 7th VMFs merged into a single Pacific Fleet once again; the 4th VMF and 8th VMF re-merged into a single Baltic Fleet in February 1956. The AVMF acronym was introduced that same year. The North Fleet and the Black Sea Fleet were never divided.)

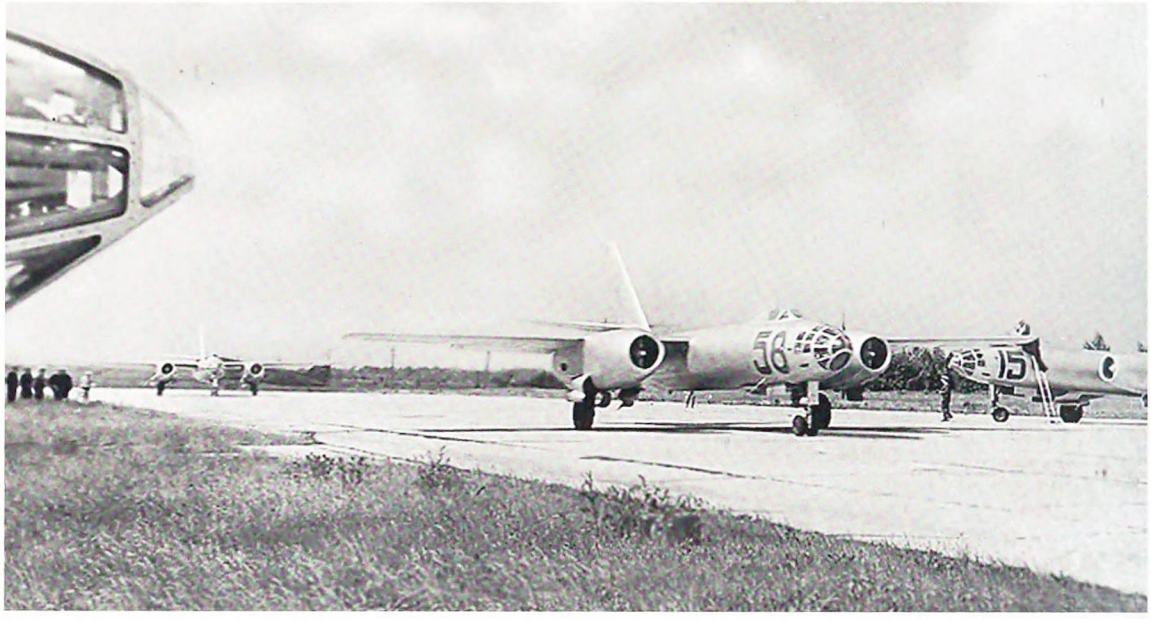
Another Baltic Fleet unit equipped with the IL-28 was the 66th MTAP of the 19th MTAD. In accordance with its combat training schedule for 1953, first of all, the Naval Aviation was to complete the transition of its minelayer & torpedo-bomber units and fighter units to jet aircraft; secondly, it was to commence IMC flying training and instrument approach training. Finally, the minelayer and torpedo-bomber units that had re-equipped with jets in 1952 were to master the techniques of high-altitude bomb delivery by means of the synchronised optical bomb sight, torpedo attack and naval mine placement.

In the **Black Sea Fleet**, the 1676th *Kon****stants****skiy* MTAP – formerly the 569th DBAP (***dahl'****niy bom-bardi****rov****ochnyy*** ***a****via****polk*** – Long-Range Bomber Regiment) – led the way, commencing IL-28 conversion training and receiving the first four jets in October 1951. This was the second naval *Beagle* unit; the honorary appellation had been given for its part in taking the Romanian city of Constanța during the war. It was part of the 688th MTAD (ex-88th DBAD, ***dahl'****nyaya bombardi****rov****ochnaya*** ***a****viadi****vee****ziya* – Long-Range Bomber Division) headquartered at Gvardeiskoye AB near Simferopol' in the Crimea, along with the co-located 1675th MTAP and 5th GvMTAP (which also operated the type). The 1676th MTAP gained the distinction of being the first Naval Aviation unit to use RAT-52 rocket-propelled torpedoes, making 54 test launches in September-October 1953.

In 1952 the 1675th MTAP was transferred to the Black Sea Fleet's 2nd GvMTAD; instead, in February 1954 the 688th MTAD was bolstered with a further *Beagle* unit, the 1817th MTAP at Vesyoloye AB ('Merry airbase') near Dzhankoy in the Crimea, transferred from the same 2nd GvMTAD.

On 30th April 1955 the 688th MTAD became the 141st MTAD, the constituent 1676th and 1817th MTAPs becoming the 943rd and 981st MTAPs. In March-August 1955 the latter unit was briefly part of the 2nd GvMTAD under both its old and new numbers.

In August 1955 the 5th GvMTAP was transferred to the newly formed 88th TBAD (the second thus designated). In 1957 the 141st MTAD HQ and the 943rd MTAP moved to Oktyabr'skoye AB, also in the



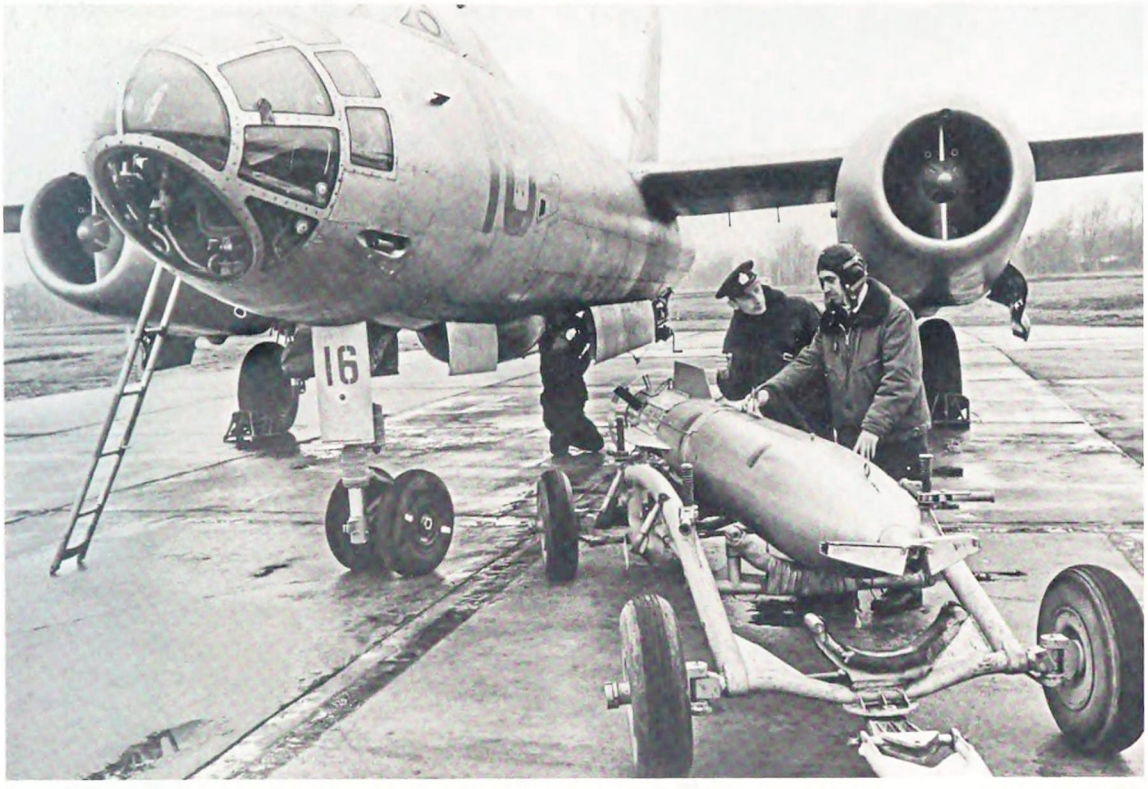
Two Baltic Fleet/ 759th MTAP IL-28s taxi past a third *Beagle* at Kaliningrad-Khrabrovo, with a Li-2 staff transport in the background.

'35 Red', another 759th MTAP IL-28, is refuelled by a TZ-200.

Crimea; in January 1958 the division disbanded, ceding the 943rd and 981st MTAPs to the 88th and 2nd Divisions respectively.

The 2nd GvMTAD at Novofyodorovka AB near Saki in the Crimea comprised the co-located 13th GvMTAP, 1675th MTAP and 1817th MTAP, all flying IL-28s; the latter unit was commissioned in March 1951. By November 1952 the division HQ had moved to Vesyoloye AB. As noted above, the 1817th MTAP went to the 688th MTAD, later briefly returning to become the 981st MTAP. By 1957 the 1675th MTAP had been renumbered as the 942nd MTAP; the 'prodigal' 981st MTAP returned again in March 1958. The 819th GvBAP was transferred from the Air Force's 48th VA/164th GvBAD in August 1958 and became the 819th GvMTAP.

With an APA-2 GPU in attendance, IL-28 '17 Red' creates a nice reflection as it is prepared for flight at Khrabrovo. The canvas covers have been bundled into a heap under the port wing. The huge size of the tactical code is noteworthy.



A navigator checks an RAT-52 rocket-propelled torpedo before it is loaded into an IL-28T coded '16 Red'. Note the BL-47 hand-cranked bomb hoist clipped into position aft of the bomb bay. The white lines on the nosewheels are a visual reference for checking that the tyres sit tight on the rims (which they might not if tyre pressure is too low).

In 1961 the 455th MTAP was established in the Black Sea Fleet, inheriting the titles and award of the recently disbanded 13th GvMTAP. Thus, rather strange things were going on in the Naval Aviation at the end of the decade – new MTAPs were being added even as existing ones were being stood down. This unit used the Yevpatoriya target range on the Black Sea and the range at the Arabatskaya Strelka sandy spit on the Sea of Azov for torpedo-bombing practice. A destroyer would tow a target on a long cable; the IL-28Ts would drop inert RAT-52 torpedoes, and these were to pass under the target for a practice 'hit' to be registered. After using up the fuel the torpedoes surfaced and were retrieved by a recovery launch.

Another view of the same scene, now with the pilot in attendance. This aspect shows well the size of the torpedo, its cruciform fins and annular rudder. The ground handling dolly is fairly sophisticated, with four adjustable supports featuring ratchets, and is designed to be towed by a vehicle; compare this to the one depicted overleaf.

A similar scene at a different AVMF base; the IL-28T ('10 Red') is being refuelled at the same time. Here the RAT-52 torpedo rests on a much cruder non-adjustable dolly which is apparently designed to be propelled by manpower.

Soviet Navy airmen wearing leather jackets and 1950s-style white-topped caps receive the 'ready to fly' report from the crew chief. The rightmost man must be the navigator with his 'brainbag'. Note that the aircraft is an IL-28R with the rarely seen Koors radar, as evidenced by the enlarged radome.

In the **Pacific Fleet**, the IL-28 saw service with several units, including the 5th VMF's 1535th GvMTAP of the 589th MTAD (formerly the 114th GvBAP of the 194th BAD, which was transferred to the Navy wholesale); it was based near Port Arthur in China and previously flew the Tu-2. The division moved to the Soviet Union's Primor'ye Territory in 1955 and became the 130th MTAD, the regiment being renumbered the 926th GvMTAP in the process. Both the division and the regiment disbanded in 1958.

The 5th VMF's 567th GvMTAP re-equipped with the IL-28T in late 1951. The 568th MTAP of the 692nd MTAD did the same in late 1953, moving to the newly built Mongokhto AB (aka Kamennyy Ruchey – 'Stone Brook'). In 1956 it mastered the RAT-52 torpedoes but did not have a chance to use them before it began converting to the Tu-16 in January 1957.

The **North Fleet** did not follow suit until 1953, the 574th MTAP being the first IL-28 operator there. In contrast, two North Fleet units (the 9th GvMTAP and the newly established 1941st MTAP) equipped with the Tu-14T in April and May 1952 respectively. The 924th GvMTAP took up residence at Severomorsk-1 AB (Murmansk Region) in the spring of 1955.

The Navy's reconnaissance units began re-equipping with the IL-28R in March 1952. The first three – the North Fleet's 1733rd ORAP, a single squadron of the 8th Fleet's 15th ORAP on the Baltic Sea and a single squadron of the 5th Fleet's 50th GvORAP on the Pacific based at Novorossiya-Zapadnaya AB (= Novorossiya-West), Primor'ye Territory – converted to the *Beagle* almost concurrently. The 1733rd ORAP was renumbered as the 967th ORAP in April 1955 but converted to the Tu-16R in 1956; the 50th GvORAP did the same in 1958. Two special ferry squadrons – the 222nd Sqn of the Black Sea Fleet and the 555th Sqn of the 5th Fleet – were established for ferrying brand-new aircraft from the factories to first-line units. Later, however, production aircraft were delivered to the fleets by ordinary service pilots. In addition to IL-28Rs, ordinary Black Sea Fleet IL-28s were sometimes outfitted with SIGINT gear for eavesdropping on Turkish communications as the aircraft flew over the sea along the 43rd Parallel.

Following the example of the Air Force, in 1954 the Naval Aviation began setting up special mission squadrons equipped with IL-28N nuclear-capable bombers. The aircrews in these squadrons showed an especially high training standard – sometimes at the expense of the other airmen in the regiment because, needing to maintain constant proficiency, the IL-28N crews enjoyed priority when flying shifts were allocated while the others had to wait. The 'nuclear strike' crews trained very intensively under various special programmes and were characterised by the ability to deliver their bombs with high accuracy on the first run-in and at the exact assigned time, which was sometimes assigned in mid-mission. The special mission squadrons were disbanded in the early 1960s when the Tu-16A nuclear-capable bomber came on the scene.

Another publicity shot showing IL-28T pilots and navigators with their mounts.

When the Tu-4K missile carrier entered limited service with the AVMF, someone suggested a joint strike tactic. First, the Tu-4Ks would launch their KS-1 (AS-1 *Kipper*) anti-shipping cruise missiles, keeping the enemy air defences busy, whereupon the IL-28Ns would deliver nuclear strikes at minimum intervals. However, considering the huge difference in the bombers' performance (the IL-28 was much faster but had much shorter range), organising such joint operations would be a problem and the idea was deemed impracticable.

In the 1960s the need arose to conduct aerial reconnaissance deeper in enemy-held territory and increase the scope and veracity of the intelligence thus obtained. The IL-28R no longer met the Navy's requirements, as it could not go farther than 800-1,000 km (496-621 miles) beyond the forward line of own troops (FLOT) and its ability to detect surface

A Naval Aviation IL-28R rests between missions, with the towbar beside the nose gear unit. This one has the standard PSBN-M radar.

'57 Red', one of the IL-28s operated by the AVMF's 33 TsBP i PLS training centre at Nikolayev-Kul'bakino AB.

targets was limited by the modest performance of its radar. In 1957 the Naval Aviation's reconnaissance units began converting to the Tu-16R, which had both longer range and more sophisticated mission equipment. By 1963 the *Badger-E/F* had virtually replaced the *Beagle* in naval service. This re-equipment took time, though; as of mid-1957 some of the AVMF's reconnaissance regiments had three squadrons, each operating a different type (Tu-16R PHOTINT/ELINT aircraft, IL-28R PHOTINT aircraft and IL-28RTR ELINT aircraft).

Naval IL-28 crews took their training at the Nikolayev Minelayer and Torpedo-Bomber Flying School named after Sigizmund A. Levanevskiy (VMMTAU – *Vo**yen**no-mor**sko**ye **min**no-tor**ped**noye aviatsi**on**noye oo**chil**ishche*) in Nikolayev, southern Ukraine. This college, which was at Kul'bakino AB on the south-eastern limits of the city, later became the basis for the AVMF's 33rd TsBP i PLS named after Yevgeniy N. Preobrazhenskiy.

The Nikolayev VMMTAU started getting to grips with jet aircraft in 1952. At the time it had no fewer than eight training air regiments with assorted aircraft enabling the full cycle of pilot training – from the Yakovlev Yak-18 *Max* basic trainer to the IL-28/IL-28T used for live weapons training. The training of cadets on the IL-28 at Nikolayev commenced in 1953; that year the entire instructor staff of the college's first jet bomber training regiment received their IMC and night flying ratings on the *Beagle*. In 1954 the two Yak-18 regiments were transferred to the newly established 93rd VMAU specialising in *ab initio* pilot training. Of the remaining six regiments, two used IL-4Ts, Tu-2s and UTB-2s as interim types; the other four flew Li-2s and IL-28s, training *Beagle* crews and 'separate' navigators. (The latter were not permanently part of a crew but were included as required.)

The flying training was quite intensive, the squadrons flying in full strength every other day. One day in each squadron was allotted for theoretical training; the next day there would be two flying shifts, with two flights of IL-28s making their sorties during each shift. Each squadron had 32 aircraft on strength. In the winter, however, the intensity of flights in the training regiments declined, and occasionally the cadets' training sorties stopped altogether because the instructors were improving their own flying skills and getting to grips with new weaponry. Each year the Nikolayev VMMTAU trained more than 200 torpedo-bomber crews which quickly commenced active duty at

IL-28 '17 Red' was operated by the Naval Aviation's 35th OAE (Independent Air Squadron).

the fleets after graduation. Another Naval Aviation training outfit preparing IL-28 crews was the Officers' Courses in Riga.

By the mid-1950s the IL-28T did not meet the Soviet Navy's requirements any longer. Besides, the military reform (read: arms reductions) initiated by Nikita S. Khrushchov in 1960 and his general bias towards missiles dealt a severe blow to bomber aviation in general and naval bomber aviation in particular. All AVMF minelayer and torpedo-bomber units were either disbanded or transformed into naval missile strike units, re-equipping with the much more capable Tu-16. In fact, some had managed to operate the *Badger-A* as a torpedo-bomber for a while; for example, the Black Sea Fleet's 943rd MTAP re-equipped with Tu-16Ts in May 1957.

The cutbacks in the AVMF proceeded in two stages. Up to June 1960 the air units (including most of the MTAPs) were disbanded; they were followed in October 1960 by the air divisions' command structures and the support units. In the Black Sea Fleet the 2nd GvMTAD and its 13th GvMTAP were stood down on 27th March 1960, as was the 819th GvMTAP of the 2nd GvMTAD. The 981st MTAP disbanded on 13th September 1960. The 455th MTAP was transferred to the Air Force, becoming the 455th BAP and moving to Voronezh-Baltimor AB. In the Pacific Fleet, the 567th MTAP was disbanded in 1960. True, in 1961 a new IL-28 torpedo-bomber unit – the 867th MTAP – was established at Nikolayevka AB 37 km (23 miles) north-east of Nakhodka, Primor'ye Territory, inheriting the latter unit's awards and titles, but in 1965 it became a reconnaissance unit (the 867th ORAP).

Well-equipped garrisons that had been bustling with activity a short while ago turned into ghost towns and were looted by the local populace. Aircraft and warships with plenty of service life remaining were thoughtlessly scrapped, succumbing to the introduction of missile systems. In the Pacific Fleet alone, more than 400 IL-28s, MiG-15*bis* and assorted MiG-17s were disposed of within a short time. In early 1961 the AVMF's reconnaissance squadrons operating IL-28Rs were disbanded. Many naval IL-28s were scrapped or, at best, transferred to 'friendly nations' (China and Indonesia), together with stocks of RAT-52 torpedoes.

Following the example of their colleagues in the North Fleet, the Baltic Fleet's 759th OMTAP (*otdel'nyy **min**no-tor**ped**nyy **a**via**polk*** – Independent Minelayer & Torpedo-Bomber Regiment) converted ten IL-28 bombers and IL-28T torpedo-bombers to IL-28PL 'quick fix' ASW configuration for providing on-call support. In 1966 the HQ of the Baltic Fleet Air Arm approached the Soviet Navy Chief HQ, requesting the formation of two regiments equipped with the IL-28PL, but the request was turned down.

Armourers of the Northern Group of Forces' 1101st BAP reload the tail cannons of an IL-28 at Brzeg AB, Poland.

Foreign deployments: near...

As mentioned earlier, many of the IL-28 units were stationed in the western military districts, as close as possible to the potential adversary. Still, even if the bomber managed to get that far and deliver the bomb, it had virtually no chances of returning to base because, with all the evasive manoeuvres, it was sure to run out of fuel on the way home. To remedy this, auxiliary airfields were initially built in Poland and East Germany where the bombers were to make refuelling stops. Later, bomber units operating the IL-28 were stationed in some of the Warsaw Pact nations, which placed them within striking range of the south coast of England.

After the Second World War the Soviet Union maintained a strong military presence in **Germany**. Initially this was known as the Group of Soviet Occupation Forces in Germany (GSOVG – ***Groop**pa so**vet**skikh okkupatsi**on**nykh voysk v Gher**mah**nii*); the 'occupation' bit was dropped in 1949 when the German Democratic Republic (East Germany) came into being. In 1989 the GSVG changed its name to the Western Group of Forces (ZGV – ***Zah**padnaya **groop**pa voysk*). Even after German reunification on 3rd October 1990 and the collapse of the Soviet Union later that year the Soviet/Russian troops, including the air units, stayed in Germany until the final pullout in 1994.

The Air Force component of the GSVG was the 16th Red Banner Air Army headquartered at Wünsdorf, a

The flight line at Oranienburg AB in the 1980s, with a GSVG Mi-24 V making a low pass over six IL-28 target tugs. Note the serviceman on a bicycle, a perennially popular kind of transport at Soviet airbases.

township 40 km (25 miles) south of Berlin, dubbed 'the capital of the GSVG' because it also hosted the HQ of the Group. This Air Army was the *crème de la crème* of the VVS and was tasked with the defence of any WarPac countries, should NATO forces attack them. Over the years its order of battle changed perceptibly.

In the 16th VA the bomber versions of the *Beagle* served with the 166th BAD, replacing the Pe-2 dive bombers. The division comprised the 207th FBAP at Finow AB (from 1956), the 221st (?) FBAP at Oranienburg AB (April-December 1951 and August 1954 – August 1956), and the 668th FBAP at Brand AB with 35 aircraft (from the 1950s). In addition to these bases, the IL-28s operated from Brandis AB (only occasionally), Finsterwalde AB (briefly, early 1950s), Lärz AB (1950s), Neu-Welzow AB (20 bombers first seen in 1953) and Werneuchen AB.

An IL-28 from Oranienburg crashed near the village of Teschendorf 13 km (8 miles) north of the base in February 1956; another one was lost in August, just 2 km (1.24 miles) from the site of the previous crash. Shortly afterwards, on 26th August 1956, the regiment pulled out from Oranienburg. Military observers from the Allied nations and the local residents were invited to see the bombers' departure as a goodwill gesture and a small air fest was held.

The information on these units is somewhat contradictory. Some sources state the entire bomber division pulled out of East Germany in 1960, leaving the GSVG with the trainers and special mission versions. Others say the 207th FBAP and 668th FBAP re-equipped with Yak-28s in 1965 and stayed in East Germany.

In the reconnaissance role the IL-28 likewise replaced the Pe-2R in service with the GSVG. The IL-28R PHOTINT version and the IL-28RTR ELINT aircraft served with the 11th ORAP, operated from Allstedt AB (1968-70) and Jüterbog-Altes Lager AB (early 1950s). Later the unit re-equipped with the supersonic Yak-27R *Mangrove* tactical PHOTINT aircraft.

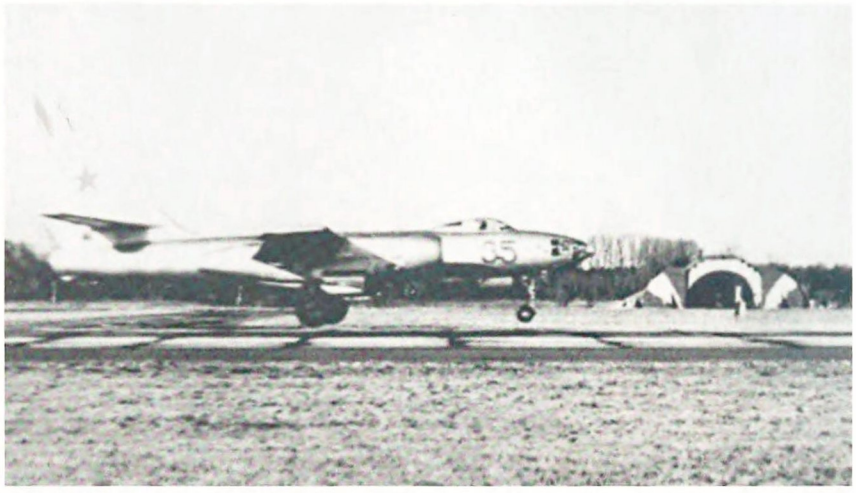
The final version deployed In East Germany was the target tug. Several of these aircraft working with assorted targets served with the target-towing flight at Berlin-Schönefeld airport, which later moved to Brand AB in 1954. It was later upgraded to squadron strength as the 65th OBAE, moving to Oranienburg in the autumn of 1971 and thence to Damgarten in 1977. Oranienburg also served as the maintenance base for the GSVG's IL-28s.

A large Soviet military contingent known as the Northern Group of Forces (SGV – ***Sev**ernaya **groop**pa voysk*) was stationed in the People's Republic of **Poland**. Its aviation component was initially known as the

37th Air Army; this was the former 4th VA that had fought in the Great Patriotic War from 1942, ending the war in Berlin. On 4th April 1968 the 37th VA regained its former identity, becoming the 4th VA once again; the official reason behind this was the wish to keep up traditions and boost the personnel's morale.

The 37th VA (4th VA) was headquartered at Legnica (pronounced *Leg**nit**sa*) in the Lower Silesian Voïvodeship (province). In the late 1950s it included the 183rd *Ber**lin**skaya* BAD formed at Brzeg AB in mid-1954, comprising the 131st, 1101st and 1107th BAPs. By August 1960 the division had been disbanded as part of the Khrushchov era defence cuts and the three regiments withdrawn to the USSR. In particular, the 131st BAP was relocated to Aleysk (Altai Territory) in July 1960 and disbanded; the 1107th BAP was redeployed to Belorussia and reorganised as the 306th Engineering Regiment (a missile unit).

In addition, the 4th VA included the direct reporting 164th ***Ker**chenskiy* GvORAP (thus named for its part in the liberation of Kerch). The unit transitioned from the Douglas A-20B to the IL-28R in 1954 when it was stationed at Krzywa AB (pronounced ***Ksheeva***); a number of IL-28U trainers was also on strength. On 31st December 1958 the 164th GvORAP returned to Brzeg AB (pronounced 'Bzheg') where it had been based until November 1952. The unit stuck with the *Beagle* until 1973, even though the Yak-27R served alongside it from 1961; from 1967 onwards both types were progressively replaced by the Yak-28R.



An IL-28 of the 65th OBAE coded '35 Red' lands on runway 07 at Damgarten AB.

One more unit of the 4th VA was a target-towing flight attached to the 164th GvORAP – the 5th OBAZ, which initially operated from Brzeg AB but moved to Żagań AB (pronounced ***Zha**gan'*) in 1981. Initially the unit had five aircraft – two IL-28 target tugs (one of them vanished in 1976), an ordinary IL-28 bomber, an IL-28PP ECM aircraft and an IL-28U. The 5th OBAZ also operated from Kołobrzeg and Kłuczewo as required, providing gunnery practice at the SGV's target ranges – Przemków-South, Świnoujscie and a third (unspecified) range near Krzywa AB.

The target tugs provided targets for ZSU-23-4 Shilka self-propelled quadruple 23-mm AA guns, ZSU-2-57 SP twin 57-mm (2.24 calibre) AA guns and DShK 12.7-mm

GSVG airmen pose with the same aircraft at Damgarten.

Above: '34 Red', another IL-28 target tug serving with the 65th OBAE, shares the flight line at Damgarten with a camouflaged Yak-28R.

Right: Rear view of a 65th OBAE IL-28 taking off; the towbar is fully raised and no target is attached.

(.50 calibre) machine-guns. The bomber, which was the only aircraft in the flight equipped with a radar, carried SAB-100-90 flare bombs which were used as targets for infrared-homing shoulder-launched SAMs; the use of these bombs was restricted to the maritime target range at Świnoujscie after an incident when a flare bomb set fire to a forest and 40 ha (98.84 acres) of forest were lost. PM-6 diving targets carried under the wings by IL-28RBNs were used in the same way. Occasionally the bomber was used for dropping dummies with parachutes, simulating an airborne assault during exercises. The IL-28PP was used to provide an ECM environment for the gun-laying radars of the SP guns.

Maintenance was performed either by the 164th GvORAP's maintenance shop at Brzeg or by the division-level aircraft repair shop (DARM – *divizi**on**nyye **a**viare**mont**nyye master**ski**ye*) of the SGV's 149th BAD at Żagań. The final sorties were flown in 1985, when the *Beagles* apparently ran out of service life, and the flight disbanded on 2nd June 1986.

The aviation component of the original Central Group of Forces stationed in Austria and Hungary in 1949-55, which was disbanded in 1955 after the Soviet pullout from Austria, was the 59th VA headquartered at Vienna-Liesing. When the Southern Group of Forces (YuGV – ***Yoozh**naya **groop**pa voysk*) was set up instead, in 1955-57 the Soviet units remaining in **Hungary** were part of the provisional Special Corps (OK – *O**sob**yy **kor**pus*).

The YuGV was headquartered in Budapest (Mátyásföld area) and established from most of the units that had participated in Operation *Vikhr'* (Whirlwind) – the suppression of the Hungarian anti-communist uprising in November 1956. Its Air Force component was still known as the 59th VA for a while. Among other things, its order of battle included the 177th *Cher**kas**skaya* GvBAD (HQ Debrecen) comprising

A 65th OBAE pilot poses for a photo with IL-28 '35 Red' at Damgarten. Oddly, he is wearing a winter outfit with a fur collar, albeit the green grass suggests the photo was taken in the late spring or summer. The Ural-375D 6x6 army lorry is an APA-5 GPU.

65th OBAE IL-28 '11 Red' parked in front of a jet blast deflector at Damgarten.

Three more *Beagles* from the same unit, including '05 Red' and '10 Red'.

the 674th ***Vis****lenskiy* GvBAP, 727th *Cher**kas**skiy* GvBAP (both likewise at Debrecen) and 880th *Vislenskiy* GvBAP at Kunmadaras, all equipped with IL-28. The appellations of the division and the 727th GvBAP were given for liberating the Ukrainian city of Cherkassy in the Great Patriotic War, while the 674th GvBAP and 880th GvBAP got their appellation for their part in the liberation of Poland when the Soviet troops crossed the Wisła River. Some sources also report the 164th GvBAD/748th GvBAP as stationed in Debrecen in 1954.

When the 177th GvBAD disbanded in 1960, its former units became direct reporting. The 727th Regiment became the 727th GvOBAP (*Gvar**dey**skiy ot**del'**nyy bombardi**rov**ochnyy **avia**polk* – Guards Independent Bomber Regiment) with 33 *Beagles*, including ten IL-28Ns, and three IL-28U trainers, while the 674th GvBAP and 880th GvBAP were 'demoted' to reconnaissance squadrons as the 97th GvORAE (*Gvar**dey**skaya ot**del'**naya raz**ved**yvatel'naya **avia**eskad**ril'**ya* – Guards Reconnaissance Squadron) and 315th GvORAE respectively. Additionally, there was the 328th Vislenskiy GvORAP (with IL-28Rs/IL-28Us) at Kunmadaras, into which the 97th GvORAE merged in September 1977, and the independent target-towing flight (OAZBVM – *ot**del'**noye **aviazve**no booksi**rov**shchikov voz**doosh**nykh mi**shen**ey*) at Kunmadaras with IL-28s and IL-28Us.

The Southern Group of Forces periodically held combined-arms exercises. One such exercise took place on 21st-27th June 1965, involving the 727th GvOBAP, 97th GvORAE and 315th ORAE, as well as local fighter units and Tu-16 heavy bombers based outside Hungary. The exercise had a nuclear scenario, and the 1st GvAPIB (with Sukhoi Su-7BM *Fitter-A* fighter-bombers) and 727th GvOBAP (with IL-28Ns) made simulated strikes with two 200-kiloton nuclear bombs each against the

Below: A convoy of tractor-trailers with IL-28 fuselages makes its way through the streets of San Julian, Cuba.

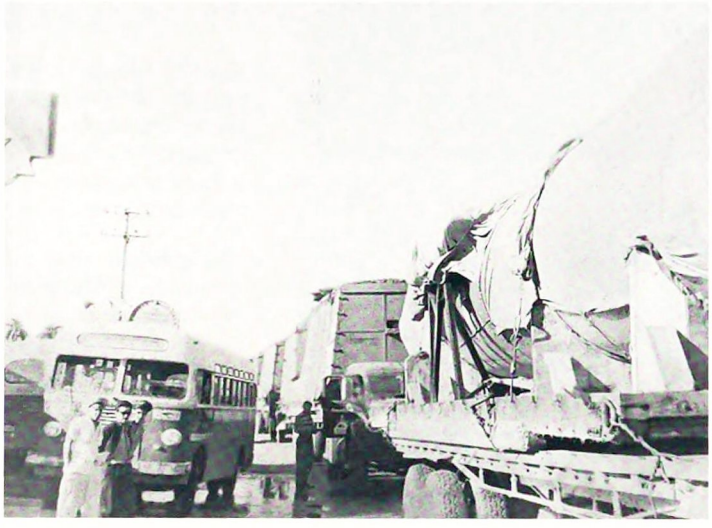
Right and below right: Cranes are used to unload IL-28 airframe subassemblies at San Julian AB. Note the bulges on the crate for the bomber's wing roots.

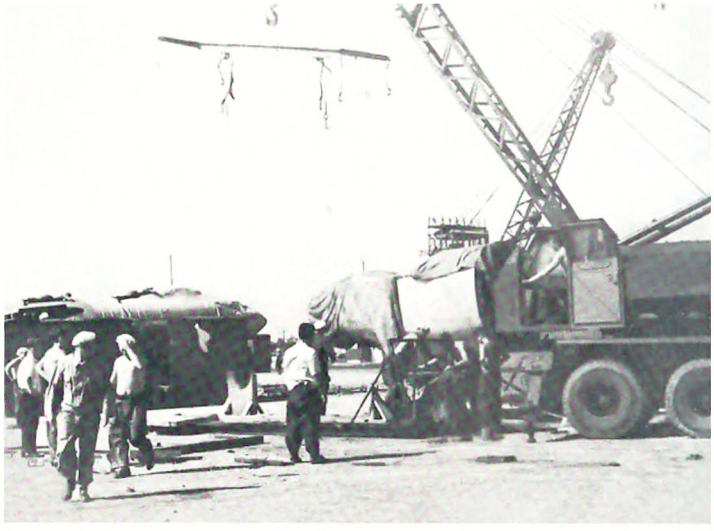
Centre left: Here an IL-28's horizontal tail secured by fixtures is offloaded from a flatbed semi at San Julian AB.

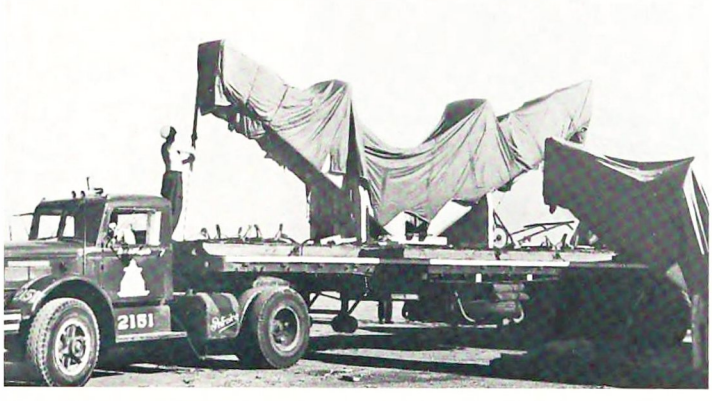
Centre right: An ATS-59 tracked prime mover hauls a wooden sled with an IL-28 fuselage on it.

Bottom: The unloading area at the base, with crated IL-28s lined up.

Bottom right: An IL-28 being assembled at San Julian. Others are waiting their turn, but most were not reassembled before it was time to go home again.







simulated adversary, which in a real-life scenario would have been Italian troops – specifically, the 'Ariete' and 'Centauro' armoured divisions.

In 1968 the YuGV's Air Force contingent was redesignated as the 36th VA. In the 1980s the 36th VA's order of battle included only one *Beagle* unit – the 8th OBAE at Sármellék with three target tugs and one IL-28U. It was redeployed to Kunmadaras and Debrecen in 1979 and eventually withdrawn in 1984.

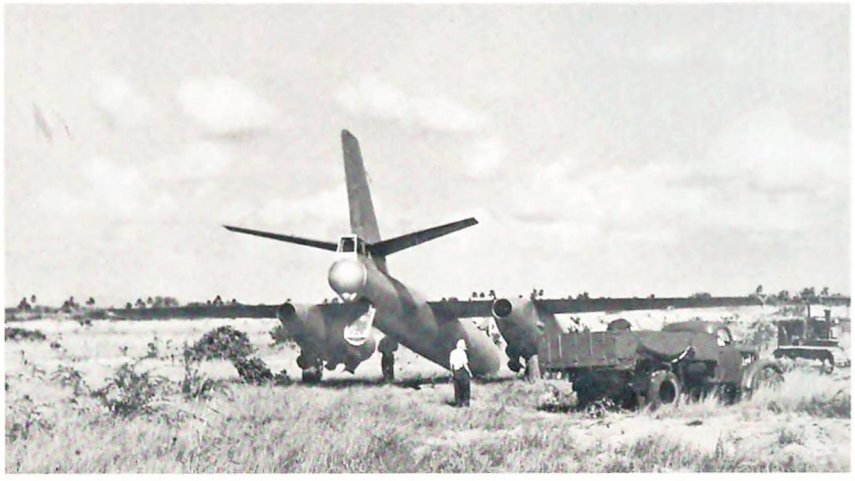
IL-28 operations in Hungary were not accident-free; in particular, one *Beagle* crashed fatally at Debrecen on 23rd December 1954 and another on 2nd September 1955. Two more were involved in a mid-air collision in 1969. In 1969-70 the 727th GvOBAP re-equipped with Yak-28 bombers and Yak-28U *Maestro* trainers.

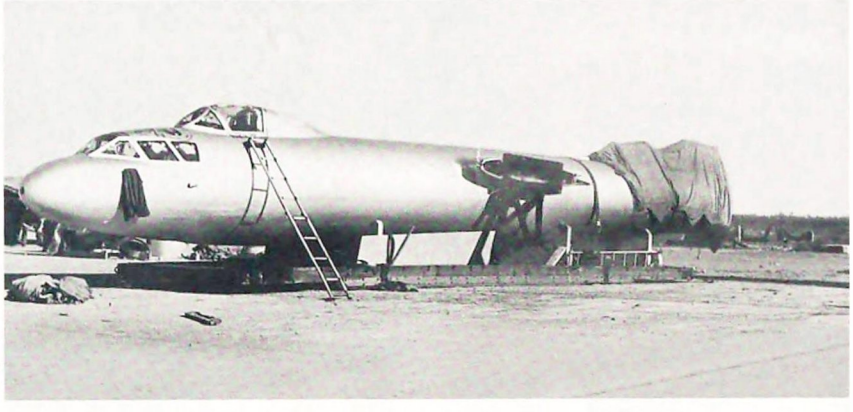
The designation Central Group of Forces (TsGV – *Tsen**trahl'**naya **groop**pa voysk*) was reused after 1968 for the Soviet military contingent in **Czechoslovakia** which was headquartered in Prague. This had a number of IL-28 target tugs based at Sliač AB near Zvolen in the 1970s.

...And far: The Cuban Missile Crisis

As often as not, it was politicians, not trigger-happy generals, who were responsible for escalation of the Cold War. The foreign deployments of Soviet IL-28 were mostly in Eastern Europe; yet a number of *Beagles* were briefly deployed all the way across the Atlantic Ocean. They were an important piece of a political crisis in September-November 1962 that put the world on the brink of the Third World War.

Despite the failure of the Bay of Pigs invasion (Operation *Zapata*) on 14th-19th April 1960, the USA did not give up the idea of toppling the Cuban communist government of Fidel Alejandro Castro Ruz. No longer relying on mercenaries and Cuban 'freedom fighters' backed by the CIA, the US administration was planning a full-scale military operation. Knowing that the small Cuban Revolutionary Armed Forces were no match for the US war machine, Castro requested military assistance from the Soviet Union. A resolution to this effect was passed at a session of the Soviet Communist Party Central Committee on 24th May 1962. In late June the Cuban leader's younger brother Raúl Modesto Castro Ruz, the Cuban Minister of Defence, visited Moscow, initialling a secret Soviet-Cuban agreement together with his colleague Marshal Rodion Ya. Malinovskiy. The agreement (which was never formally signed because things picked up speed) envisaged sending a 40,000-strong Soviet military contingent that came to be known as the GSVK (***Groop**pa so**vet**skikh voysk na **Koo**be* – Group of Soviet Forces in Cuba). This included Army, Navy, Air Force, Air Defence Force and





Top: This IL-28U came to grief when landing at San Julian. The ZiS-150 lorry is an APA-1 GPU.

Above: An IL-28U awaits assembly at San Julian AB.

Below and below left: Soviet and Cuban personnel pose with the IL-28s. Note the code '2' on one of the bombers.

Two views of 759th MTAP airmen in leather jackets and Navy white caps at San Julian AB. Their mounts (some still incomplete) are visible beyond.

Strategic Missile Forces components – specifically, three regiments of R-12 (*izdeliye* 8K63, NATO SS-4 *Sandal*) intermediate-range ballistic missiles and two regiments of R-14 (*izdeliye* 8K65, NATO SS-5 *Skean*) IRBMs. It was exactly these weapons systems that gave rise to the famous name Cuban Missile Crisis. The deployment of Soviet troops to Cuba *'to enhance Cuba's defensive capability in the face of an impending imperialist aggression'* was known as Operation *Anadyr'* (named after a Siberian river).

The Navy component of the GSVK, which is relevant for the purpose of this book, included the Baltic Fleet's 759th MTAP flying IL-28s; its main function was to ward off a possible maritime assault. As part of Operation *Anadyr'* a total of 42 *Beagles* were to be deployed to Cuba. Contrary to popular belief, only six of these were IL-28N nuclear-capable bombers; according to some reports, these were not AVMF aircraft at all but Air Force aircraft. The majority (33 aircraft) were ordinary torpedo-bombers, with a supply of RAT-52 torpedoes, and the remaining three were IL-28U trainers.

The redeployment of the 759th MTAP was conducted in utmost haste and complete secrecy. Between 4th August and 20th September 1962 the IL-28s were dismantled at their home base (Kaliningrad-Khrabrovo) and transported by rail to the seaport of Baltiysk, where they were crated and loaded aboard Soviet merchant ships between 10th September and 5th October. The loading operations proceeded round the clock.

The freighter M/V *Kasimov* was the first to depart, weighing anchor on 15th September; apart from 22 crated IL-28s, she was carrying 75 RAT-52 torpedoes, various materiel and a 368-man personnel team. Accompanied by the cruise ship M/V *Estonia*, which was carrying 65 officers and civilian specialists, the *Kasimov* set sail for Cuba. While the 'passengers' of the *Estonia* hardly noticed the two-week trans-Atlantic voyage, those unlucky enough to be sailing on the *Kasimov* suffered in the hot and stuffy holds which were absolutely unsuited for personnel. They were allowed to go topside only after dark, and then only in groups of no more than 25, to avoid blowing their cover.

The freighter M/V *Bratsk* was next, sailing from Baltiysk on 2nd October with seven aircraft, 85 RAT-52 torpedoes, 163 naval mines, other materiel and a 291-man personnel team. M/V *Al'met'yevsk* followed suit on 5th October, loaded with four aircraft, 823 practice bombs, materiel and a 280-man personnel team. M/V *Nikolayevsk* was last, departing on 11th October with 20 civilian specialists. The voyage to Cuba took about 15 days.

The ships did not arouse suspicion at first – but not for long. Col. Lev S. Yevseyev (Retd.), who was then a 759th MTAP technician and was involved in the deployment from beginning to end, arriving aboard the *Kasimov*, recalled: *'When we had passed the Bahamas, US Navy [Lockheed P-2] Neptune patrol aircraft with long magnetic anomaly detector "stingers" started "buzzing" us, flying at top deck level 30-40 m [100-130 ft] from the ship. We could see the crews' faces and the open cargo doors (sic) through which they were photographing us, using long lenses.*

Such impudence on the part of the Americans could not go unpunished. Once one of our officers ran out of patience and started lobbing potatoes at the American aircraft as it passed alongside; others joined in. Unit CO Col. Yermakov yelled in Russian (and very probably in choice language – *Auth.*) *at the potato-throwers, ordering everyone to get below. After all, how could Soviet specialists representing Avtoexport* (to disguise the nature of the cargo, the crates on the upper deck bore the logo of the Avtoexport automobile sales agency – *Auth.*) *be so rude?! This could blow our cover and the Soviet deployment to Cuba could be revealed.'*

One by one the ships carrying the bombers docked at Mariel harbour (on 30th September, mid-October and 23rd October respectively) and were unloaded. The Cuban authorities allocated San Julian AB located in the south-east of the island, 15-20 km (9.3-12.4 miles) from the coast, as a temporary base for the *Beagles*. On 14th September the Soviets began reassembling the first two aircraft, including an IL-28U.

Yet, before all of the *Beagles* had been reassembled, the situation changed. The Americans were quick to discover the presence of the Soviet military on Cuba, but the IRBMs were not detected until 14th October when a USAF spyplane overflew the missile site. Two days later this was reported to US President John F. Kennedy. The US military top brass insisted that the Soviet positions on Cuba be bombed, with an ensuing US landing assault; fortunately wiser counsels prevailed. Addressing the American nation on 22nd October, JFK announced a 'quarantine' of Cuba – putting it plainly, a naval blockade – to prevent any further deliveries of offensive weapons. He said that any missile launch from Cuban territory would be regarded as aggression and would mean an immediate retaliatory strike against the Soviet Union. The tension started growing by the hour; immediately after this speech the Cuban armed forces and the GSVK were placed on maximum alert duty. On 23rd October the Soviet and US armed forces followed suit. The blockade was enforced on 24th October.

We'll let Lev S. Yevseyev tell the story again. *'The Americans flew daily reconnaissance sorties over our airfield, from 9 AM to lunchtime, and they were very punctual. The Americans always flew above us in pairs; the first lead aircraft had open camera ports under the fuselage, while the other aircraft flying behind it, a little higher, was a combat aircraft. They used to fly very low.*

One day about 20 GAZ-53 lorries with quadruple anti-aircraft machine-guns in tow and the gun crews sitting on the truck bed arrived at the airfield. (*Sic.* For one thing, the GAZ-53 is a 3-ton (59-cwt) rear-wheel drive commercial lorry; for another, it had only entered production in 1961, and there were hardly any exports to Cuba yet – all the more so because the tropicalised version would be required! Yevseyev probably means the GAZ-63, an older 2-ton (39.36-cwt) four-wheel drive army lorry – *Auth.*) *They took up positions around the base perimeter. Two days passed; some Cuban military brass hats arrived and assembled at the control tower where our regiment's command staff was. Just then, two American fighters put in an appearance. As they made a low pass near the tower, someone loosed off a volley from an assault rifle. We never did find out who it was. Perceiving this as a signal, the Cuban AA gun crews opened fire. [...] I clambered up on the wing of my aircraft, which was standing under wraps, and looked up. Rounds were exploding above, below and ahead of the Americans but no one could score a hit. The Americans made three passes; three times the heavy machine-guns opened fire – with zero results. The Americans completed their objective and got away unscathed. After this episode, however, they stopped flying over us for a while.'*

A 759th MTAP officer holds a Cuban flag after the unit's return to Kaliningrad (Khrabrovo AP) in January 1963.

The Soviet-Cuban Friendship Medal awarded to the participants of the Cuban deployment.

However, faced with the increasing probability of an all-out war with the USA which would be a war of annihilation, the Soviet leaders had the common sense to back down and seek a political solution. On 26th October Nikita S. Khrushchov finally acknowledged the deployment of Soviet missiles to Cuba (which he had hitherto denied) but stated they would never be used against the USA. He offered to Kennedy to withdraw all Soviet offensive weapons from Cuba in exchange for a pledge of non-aggression against Cuba; he also demanded that the US ballistic missiles deployed in Turkey, which were causing great concern of the Soviet government, be withdrawn. On 27th October JFK replied that the USA guaranteed non-aggression and that the blockade of Cuba would be lifted – on condition that the withdrawal of the Soviet offensive weapons be monitored by the United Nations. A day later the Soviet government accepted this offer, making an appropriate statement. Between 5th and 9th November all 42 IRBMs were shipped back to the USSR and the launch pads were demolished.

Now, the IL-28s were originally not covered by this statement, and the 759th MTAP proceeded to assemble and fly them. The first two had been assembled by 29th October; the IL-28U made its first flight from San Julian AB on 30th October. By 10th November seven aircraft had been assembled and check-flown, three others

were 80% complete and a further three 40% complete. A total of five flight shifts was made, involving 77 practice sorties with 23 hours 12 minutes' total time. Occasionally the IL-28s were shadowed by US fighters, and the gunners were instructed on pain of death not to move the cannons so as not to provoke a conflict. All the aircraft were devoid of insignia, the Soviet stars having been removed before the deployment.

Soon, however, the Americans decided to term the IL-28s as offensive weapons and demanded their withdrawal in spite of Soviet claims that the bombers served a purely defensive role. A disagreement associated with the bombers could cause all the progress achieved by then to go down the drain. On 12th November GSVK Commander Gen. Ivan I. Pliyev gave orders to halt further assembly of the aircraft. In an effort to defuse the situation, on 20th November the USSR pledged to withdraw the IL-28s as well within 30 days and agreed to let the Americans monitor the withdrawal. Consequently, that same day JFK instructed Secretary of Defence Robert Kennedy to remove the naval blockade.

Starting on 21st November the few aircraft already assembled were dismantled again and prepared for shipping (some observers claimed it would have been cheaper and easier to scrap them on site, since they were unwanted anyway). On 1st-5th December the bombers and associated weaponry and materiel were loaded aboard the Soviet freighters M/V *Kasimov* (15 aircraft), M/V *Krasnogradsk* (15), M/V *Okhotsk* (12) and M/V *Kimovsk* at Mariel harbour; the 759th MTAP personnel departed on 16th December aboard the cruise liner M/V *Mikhail Kalinin*. The ships' destinations were Kaliningrad (*Kasimov* and *Krasnogradsk*), Nikolayev (*Okhotsk*) and Baltiysk (*Kimovsk* and *Mikhail Kalinin*).

The Cuban leader was strongly opposed to the Soviet troops' departure (he was miffed by the fact that the decision had been taken without consulting him), but the Soviet government managed to persuade him this was the best option under the circumstances. After the pullout Fidel Castro called the IL-28 an *'obsolete aircraft with limited speed and inadequate range'* when speaking at a public rally. Obsolete they may have been, but Castro was clearly annoyed at letting go the missiles and bombers and having nothing to threaten *los gringos* with!

The 759th MTAP and the supporting personnel returned to Baltiysk just in time for the 1963 New Year celebrations. To make their withdrawal patently obvious to the Americans the IL-28s had been arranged on the ships' upper decks, with nothing more than tarpaulins to protect them from the sea spray. As a result, en route many of the aircraft were so heavily damaged by the corrosive maritime environment that they had to be written off.

The IL-28 at war

The IL-28 had its fair share of 'hot' wars, the first of which was the Korean War of 1950-53. China supported North Korea actively during the war, mustering the tell-tale 'one million Chinese volunteers' (actually regular People's Liberation Army troops) to the battlefields. This angered the USA badly enough to threaten with strikes against China, including nuclear strikes if necessary, if Chinese forces crossed the 38th parallel at which the frontline had stabilised (this was eventually to become the demarcation line between North and South Korea).

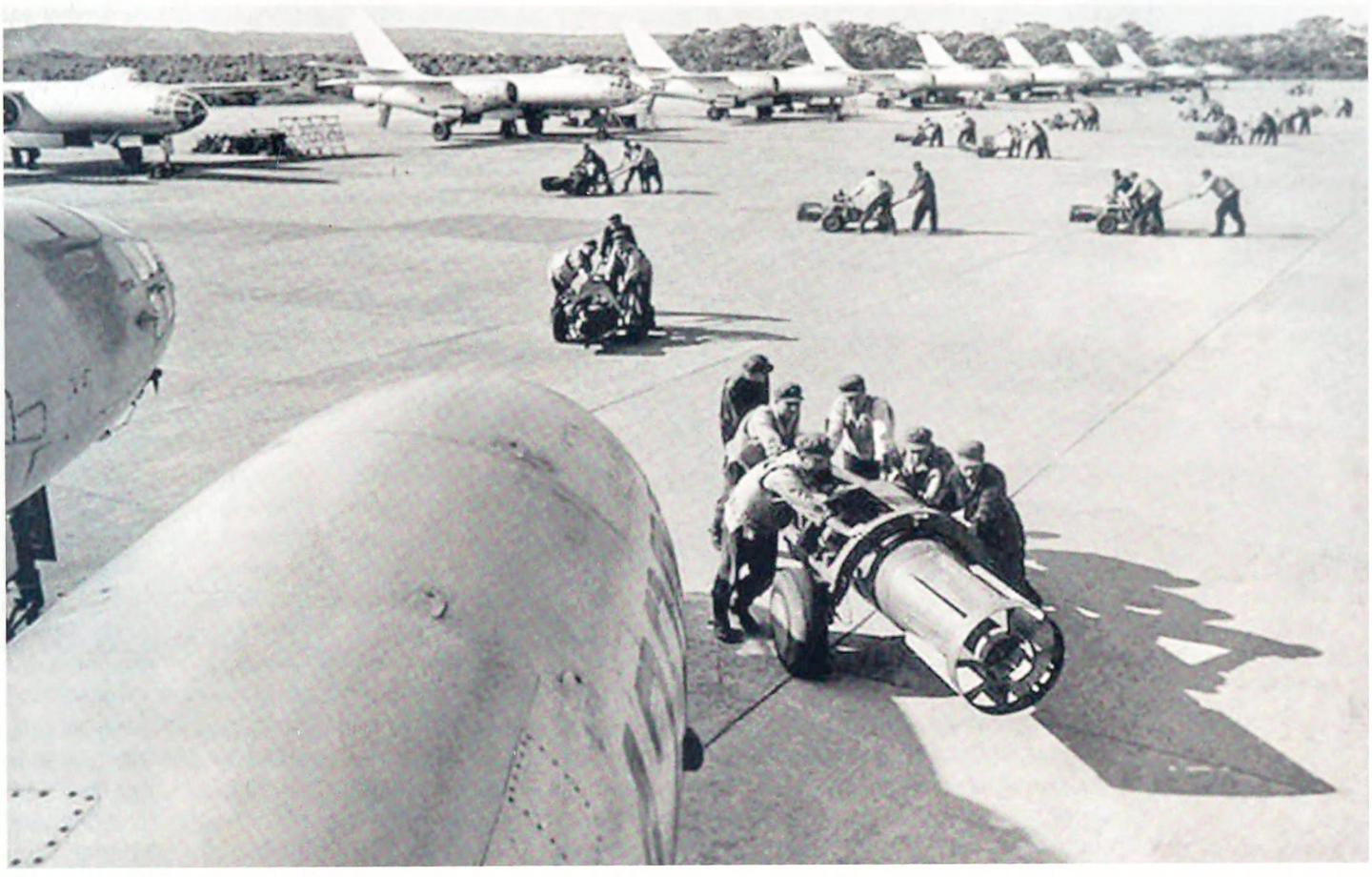
Not to be outdone, China threatened to hit both South Korea and US bases in Japan if US aircraft as much as overflew Chinese territory. To add weight to these words, 70 IL-28s were deployed to People's Liberation Army Air Force (PLAAF) air bases in Manchuria. They wore PLAAF insignia but were manned by Soviet crews.

A second major batch of Soviet-built IL-28s was delivered in 1953. It is not known if the *Beagles* actually saw action in the war, but they did put in an appearance in North Korea. UN envoys monitoring prisoner-of-war exchanges reported Chinese bombers, including IL-28s, landing illegally at airbases near Pyongyang in direct violation of the truce agreement.

A short while later, however, the IL-28 had its real baptism of fire during China's last civil war when the Nationalists led by Chiang Kai-shek claimed independence for Taiwan. In early January 1956 PLAAF IL-28s bombed the Tachen Islands 360 km (200 nm) north of Taiwan which the Nationalists were forced to abandon in February. However, the high accident rate and the danger of being shot town by Republic of China Air Force (ROCAF) Republic F-84 Thunderjets and North American F-86 Sabres forced an end to these attacks.

Soviet IL-28s never participated in a real war. The closest they came to actual combat was the abovementioned Operation *Vikhr'* in 1956 when a large group of Warsaw Pact troops – mostly consisting of a 31,550-strong Soviet task force – was deployed to Hungary to quash the anti-communist coup d'état of 23rd October – 9th November led by Imre Nagy. The Soviet Air Force units in the borderside military districts were placed on maximum alert duty, in particular, more than 120 *Beagles* based in the Carpathian MD were ready to support the Soviet ground forces and launch strikes against the insurgents. Fortunately this never happened – the ground forces pretty much managed everything (albeit with casualties). Still, Soviet IL-28s seconded to the Special Corps of Soviet Forces in Hungary quelling the uprising did fly reconnaissance missions over Hungary.

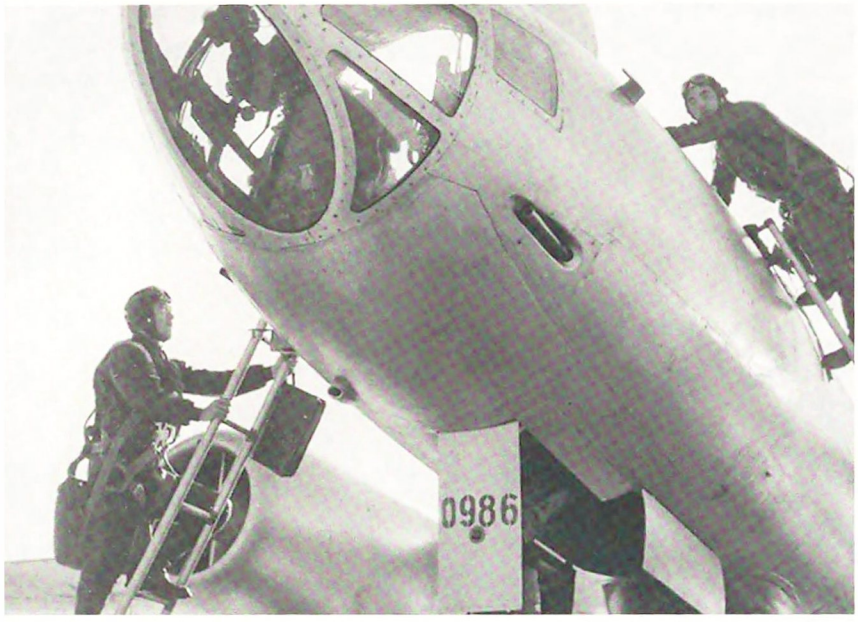
Arkadiy I. Bookin, who served in the 177th GvBAD/880th GvBAP at the time, recalled these events as follows: *'In the second half of October 1956 a military exercise began in which our Guards bomber regiment (the 880th GvBAP) was also involved. Gradually the exercise*



PLAAF armourers wheel 500-kg bombs towards H-5s as a bombing sortie in squadron strength is being prepared.

turned into real warfare, in the course of which we covered the western border [of the Soviet Union], flew PHOTINT sorties and were to fly bombing sorties if required. The weather was adverse, but nevertheless all sorties were flown successfully. On 8th November the Hungarians shot down an IL-28 from our regiment when it was photographing military industry factories on Csepel Island [on the Danube River]; the entire crew was killed.' The bodies of the airmen – pilot Capt. Aleksandr A. Bobrovskiy (squadron commander), navigator Capt. Dmitriy D. Karmishin and gunner/radio operator Lt. (SG) Vladimir Ye. Yartsev (the squadron's chief of communications) – were recovered and returned to the USSR for burial. On 18th December 1956 the crew

Heave-ho! Here the armourers of a PLANAF unit wearing distinctive striped shirts are pushing a dolly with what appears to be an AMD-4-1000 naval mine.



Chinese airmen climb into a PLAAF IL-28 serialled '0986 Red' for a sortie.

members were posthumously awarded the Hero of the Soviet Union title by decree of the Presidium of the USSR Supreme Soviet (the nation's top governing body).

However, Bobrovskiy could have avoided becoming a Hero (or should we say *an hero*?) and saved the other crewmen's lives if he had had sense enough to take evasive action when the rebels' AA artillery started firing on him. During the war Bobrovskiy had been an instructor in a reserve regiment preparing new aircrews for the frontlines; thus, he had no idea of real warfare in general and of anti-flak manoeuvres in particular. Seeing that the flak bursts were getting close to the aircraft, the Soviet command post had warned the pilot over the radio that he was under attack and told him to take evasive action, but Bobrovskiy had dismissed the warning in a high-handed manner, saying *'Don't interfere, I'm on a mission!'* No sooner were the words out of his mouth that he was hit. To quote from a poem by Jonathan Swift, he was *'too wise to take counsel, too proud to take warning'*. Yet, some chairborne political officer had overheard Bobrovskiy's last words and was so enraptured that he filed an official nomination for the HSU title to be granted to the crew.

On the other side, it is reported that a handful of Hungarian pilots who had supported the rebels made a few sorties from Kunmadaras AB, attacking Soviet troops which had built pontoon bridges across the Tisza River. Soon, however, all Hungarian airbases were overrun by Soviet troops, putting an end to the rebels' flying activities.

Another area where the IL-28 saw action in the autumn of 1956 is the Middle East. Egyptian Air Force (EAF) *Beagles* first saw action during the Suez Crisis (26th October – 7th November 1956). Great Britain was thoroughly displeased with President Gamal Abdel Nasser's independent political course; when Egypt nationalised the Suez Canal on 26th July 1956, this was the last straw. Teaming with France and with Egypt's arch-enemy, Israel, Great Britain took action. According to the plan, Israel would provoke an armed conflict with Egypt, then Great Britain and France would interfere on the pretext of ensuring the safety of international traffic in the Suez Canal and occupy the area. Stage 1, Operation *Kadesh* ('cleansing' in Hebrew), was scheduled for 29th October – 1st November and Stage 2, Operation *Musketeer*, for 1st-7th November.

By then the Egyptian Air Force (EAF) had taken delivery of about fifty IL-28s but only one squadron operating 12 aircraft was fully combat-capable. Two other squadrons had only just been formed before the fighting began, and the crews had not yet mastered the new jet bombers. Consequently the IL-28 was used in the conflict on a small scale. For instance, on the night of 31st October one of the *Beagles* bombed an Israeli kibbutz named Gezer. An Israeli Defence Force/Air Force (IDF/AF, or *Heyl Ha'avir*) Gloster Meteor NF.13 took off to intercept the intruder but could not find the target in the darkness. Same day a group of IL-28s raided Lod airbase but the bombs missed their target, exploding near the Jewish settlement of Ramat-Rachel.

The EAF top commanders fully realised that, with no qualified crews to fly them, the IL-28s would be sitting ducks and a lucrative target for the Anglo-French strike force. Hence President Nasser ordered the EAF assets dispersed to remote bases or relocated to Syria and Saudi Arabia. (It was just as well that he did; on the night of 1st November Great Britain and France launched Operation *Musketeer* as planned. RAF bombers detached to Luqa, Malta, and Royal Navy strike aircraft from the carriers HMS *Albion*, HMS *Eagle* and HMS *Bulwark* attacked Egyptian airbases in the Suez Canal area.) Twenty IL-28s were flown to the Royal Saudi Air Force (RSAF) base at Riyadh by Soviet and Czech crews; the other 24 or 28 *Beagles* moved to Luxor, Egypt's

PLAAF armourers at work cleaning the tail cannons of a Harbin H-5.

Chinese armourers uncrate 100-kg HE bombs for loading into IL-28s.

southernmost airbase, where they were supposed to be safe. This assumption out to be wrong; on 4th November RAF English Electric Canberras bombed Luxor, forcing the evacuation of eight more IL-28s to Saudi Arabia. On the same day the base was attacked by French Air Force (*Armée de l'Air*) Republic F-84F Thunderjet fighter-bombers stationed in Israel; the French claimed the destruction of every single aircraft at the base but the EAF acknowledged the loss of only seven bombers. Incidentally, an IL-28 was reportedly shot down by a French F-84F on 1st November.

Sporadic clashes between Egypt and Israel continued between the Arab-Israeli wars. Combat aircraft took part in these operations; for example, United Arab Republic Air Force IL-28s flew several night reconnaissance missions over Israel in 1958-61 – usually from Egypt but occasionally from Syria. For example, on the night of 2nd/3rd April 1958 (during the second such mission) four IL-28Rs remained undetected until the flash bombs went off. It was the same story on the night of 24th/25th November 1958 when a quartet of *Beagles* flew the full length of Israel, photographing targets. The seaport of Eilat was photographed during one such mission in December 1958.

In 1959 Chinese IL-28s saw action again when the government forces ruthlessly stamped out an ethnic

Here, an H-5 is being loaded with Chinese 250-kg bombs.

minority uprising in the Tibet. Apart from that, the *Beagles* were used in numerous skirmishes with the Chinese Nationalists – mostly over the Strait of Taiwan. Some sources suggest that IL-28Rs and HZ-5s actually overflew the island on recce sorties; several of these aircraft fell victim to Nike Ajax missiles.

One Chinese bomber, however, was lost in a different way. On 11th November 1966 pilot Li Hsien-pin, navigator/bomb-aimer Li Tsai-wang and GRO Liang Pao-sheng of the 22nd Bomber Regiment/8th Bomber Division defected to Taiwan on an IL-28 serialled '0195 Yellow'. The three had conspired to defect long before the flight, joining the PLAAF and successfully passing the complex loyalty check system.

The aircraft took off at noon from Hangzhou coastal airbase on a routine practice bombing sortie. After following the coastline for a while it turned and headed for Taiwan at full speed. Chinese fighters scrambled and gave chase – too late. The IL-28 was quickly detected by Taiwanese air defence radars; ROCAF F-104G Starfighters scrambled to intercept, escorting the bomber to Taoyuan AB after the pilot had made his intentions clear by rocking the wings. The aircraft overran on landing, collapsing the nose gear and damaging the nose glazing; all three crew members were injured, the gunner dying a day later.

The defection was timed to coincide with the centennial celebration of Sun Yat-sen, the 'father of the Chinese revolution' revered by the Communists and the Nationalists alike, which was celebrated on 12th November. Sure enough, the Taiwanese and Western press raised an almighty hype. This was compounded by the pilot, who was the least injured in the crash landing, speaking at the Centennial Rally next day and denouncing Red China and communism in general.

Meanwhile, the unfortunate event was promptly reported to the PLAAF HQ in Beijing, and retribution followed swiftly. The Air Force Vice-Commander Cheng Chung arrived at Hangzhou on the same day and probably gave everyone a thorough dressing-down. All flights from Hangzhou and other bases nearest to Taiwan were suspended until further notice.

Apart from the nose section, '0195 Yellow' was virtually intact. The Nationalists repaired and test flew the aircraft, then reportedly used it for clandestine reconnaissance flights over mainland China (some sources say the aircraft was handed over to the USA for close examination). Shortly afterwards, the British model kit manufacturer Airfix released a 1/72nd scale model of the *Beagle*.

In 1962 Syrian IL-28Rs flew a reconnaissance mission over Israel following a border incident between the nations.

In September 1962 President Nasser sent his combat aircraft (including IL-28s) to Yemen, extending military aid to the Republicans who had overthrown Prince Muhammad al-Badr and sparked a prolonged civil war; this deployment was codenamed Operation 9000. At the same time the Soviet Union also supported the Republicans, supplying them with a number of *Beagles*. The IL-28s attacked the Royalists' positions and flew reconnaissance sorties; the Western press reported that they were flown by both Yemeni and Soviet crews. (This may well be true. Soviet military personnel participated in many regional conflicts in which the Soviet Union was not formally involved, and not only in an advisory capacity; however, that was something the public back at home was definitely not supposed to know!) By 1964, when the Royalists launched a counter-offensive, there was a squadron of Egyptian IL-28s operating in Yemen. The scale of the bombers' operations became even bigger in 1967. For example, on 5th January that year a group of nine IL-28s destroyed the Royalists' headquarters in El Ketaf with FAB-250 bombs after a pair of MiG-17s had dropped smoke bombs to indicate the wind direction; Muhammad al-Badr's entire staff was killed in this attack.

Sometimes the bombers attacked the Saudi towns of Dhahran and Najran located next to the Yemeni border as a punitive action because the Saudis sided with the Yemeni Royalists and gave them military support. In June 1966 a solitary IL-28 escorted by United Arab Republic Air Force (UARAF) MiG-17F *Fresco-Cs* bombed the RSAF base at Khamis Mushayt; during the same month UARAF IL-28Rs flew reconnaissance missions over the Saudi seaport of Qizan. One particular sortie ordered personally by Nasser involved a *Beagle* carrying out a simulated attack on Nassiriya Palace (the Royal residence in Riyadh), dropping flares instead of bombs to convey the message – 'we are able to punish you, so stop supporting the wrong guys'. When the Six-Day War erupted, however, all Egyptian troops had to leave Yemen because things were bad enough back home.

The IL-28 saw action in Africa as well. In April 1967 a coup d'état occurred in Nigeria and the corrupt government was toppled by Maj.-Gen. Johnson Thomas Umunnakwe Aguiyi-Ironsi, C-in-C of the Nigerian Armed Forces. The next month, however, Ironsi was killed in a new coup organised by Col. Chukwuemeka Odumegwu Ojukwu, governor of the Eastern province and one of the leaders of the Ibo tribe (alternatively rendered as Igbo). On 30th May the rebels declared their intention to secede, forming the so-called State of Biafra named after a bight in the Gulf of Guinea. This immediately sparked a bitter three-year civil war between the separatists and the federal government.

The Federal Nigerian Air Force (FNAF) originally used six impressed Nigeria Airways Douglas DC-3s and 12 Czech-supplied Aero L-29 Delfin advanced trainers against Col. Ojukwu's rebels in the light bomber/paradrop and strike roles respectively. Pretty soon,

however, it obtained real combat aircraft from Arab nations supporting the Islamic government in Lagos in its struggle against the Christian Ibo separatists. (Actually, the first thing the Nigerian government did was seek help from the Soviet Union; however, the answer was that the Soviet Union was ready to supply the aircraft but not the airmen to fly and fight in them!) Egypt was the first to extend help, supplying 41 MiG-17Fs and, together with Algeria, six second-hand IL-28s. The first bombers arrived at Kalabar in south-eastern Nigeria in May 1968, but it was not until October that the IL-28s began flying actual combat sorties; they were flown by Egyptian mercenary crews, the pilots including Anis Khudayr and Fawzi Sha'aban.

Operating mostly from Enugu and Kalabar, the *Beagles* bore the brunt of the bombing missions but were reportedly found to be ineffective. They certainly did not venture near the Biafran capital, Uli, which was well protected by flak. Moreover, poor mission planning and the lack of a clearly-defined FLOT sometimes resulted in government forces being bombed!

Sometimes the IL-28s were used to escort the DC-3s on bombing/paradrop sorties or for strafing Biafran positions. In February 1969 a group of DC-3s escorted by IL-28s and MiG-17Fs paradropped supplies and ammunition for the government forces' 3rd Commando Brigade surrounded at Owerri. When this didn't help and the DC-3s were temporarily unflyable due to flak damage, the federal forces commandeered a Pan African Airways DC-4 which had landed at Port Harcourt, loaded it with ammunition and ordered the captain to fly to Owerri, escorted by an IL-28. However, the captain contrived an engine malfunction, forcing a return to Port Harcourt – which probably saved both aircraft and crew.

The war presented no great danger for FNAF fighter pilots and bomber crews, since the Biafran Air Force had no aircraft capable of air-to-air combat. All the enemy could put up was Malmö MFI-9B primary trainers converted into makeshift attack aircraft. Flown by mercenary pilots led by the Swedish Count Carl Gustav von Rosen, these aircraft were known locally as Minicons – probably a corruption of 'mini-COIN' (counter-insurgency aircraft) – and could only attack ground targets, which they did with a measure of success. Still, the accident rate was rather high and all the *Beagles* were soon grounded after being damaged in accidents. On 20th March 1969 one IL-28 struck trees during a low-level mission and suffered an engine failure, making a successful forced landing at Port Harcourt. Another *Beagle* veered off the strip at Port Harcourt on landing, burning out the brakes and tyres, but was later repaired. On another occasion an IL-28 was slightly damaged at Enugu by the MFI-9Bs but later repaired; there were claims that the Minicons had destroyed an IL-28 at Port Harcourt on 22nd May 1969 but these were later shown to be false – none were destroyed in that attack.

In 1967 there was trouble in the Middle East again when the third Arab-Israeli war, commonly referred to as the Six-Day War (5th-10th June 1967), broke out. The Israelis had been planning this war long and carefully – right down to building five mock Egyptian airbases in the Negev Desert where they constantly practiced raids against the real thing. Within a year all IDF/AF combat squadrons had passed a training course at these facilities.

Building on the results of this training, the Israeli high command developed a 'pre-emptive attack' plan known as Operation *Moked* ('focus' in Hebrew). The combined air forces of the Arab nations outnumbered the IDF/AF almost three times, so it was decided to destroy them on the ground rather than tangle with them in the air. The first wave of strike aircraft was to attack 19 airfields deep in Egyptian territory, knocking out the aircraft based there, but it was decided to spare the runways at the four bases located on the Sinai Peninsula so that Israeli aircraft could use them, once

At least seven Iraqi Air Force IL-28s, including 427 on the left, can be seen here abandoned at al Taqaddum airfield in Iraq.

Wearing a sand, green and brown camouflage scheme, Egyptian Air Force IL-28 '1711 Black' is about to depart on a routine sortie.

This Egyptian IL-28 wears a different sand/brown camouflage scheme. The serial appears to be 1771 Black.

the peninsula had been occupied. The first strike was scheduled between 0835 and 0910 hrs when the Egyptian fighters were not expected to be out on combat air patrol and the base commanders usually were not yet on site. This would be followed by three more waves of strike aircraft which were to destroy the greater part of the Egyptian Air Force on the ground by 2 PM. After that, the strike force would be redirected at airbases in Syria, Jordan and Iraq.

By the spring of 1967 it became clear that war was imminent; skirmishes on the Israeli-Syrian border were becoming increasingly more frequent, both sides using heavy weapons and aircraft. On 17th May Egypt started concentrating troops on the Israeli border; four days later Egypt and Israel called a mobilisation of the army reserve, and on 22nd May President Nasser declared the Suez Canal closed for Israeli ships.

Egypt, Syria, Jordan, Lebanon and Iraq had a total of some 800 combat aircraft at the start of the conflict. This total included 49 to 56 IL-28s – 35 or 40 in Egypt, ten in Iraq and four to six in Syria. These aircraft and the Tu-16 bombers (30 in Egypt, including some Tu-16KS-1 missile strike aircraft, and six in Iraq) were considered priority targets during the planned Israeli air strikes.

On the morning of 5th June the IDF/AF launched a massive assault against Arab airbases. Among other things, 28 EAF IL-28s were destroyed on the ground at Ras-Banas AB and Luxor. A further *Beagle* and its fighter escort (probably MiG-17Fs) were shot down by IDF/AF Dassault Mystère IVs while attacking Israeli troops advancing on El Arish on the Sinai Peninsula. By a curious twist of fate, six EAF (8th or 28th Sqn) IL-28s led by 1st Lt Mohammad Abdel Wahab el-Keraidy had departed Abu Suweir shortly before that to attack royalist targets in Yemen, which saved them from destruction. Moreover, they came back with a vengeance, attacking Israeli troops the following day. Also, at least five *Beagles* survived the first attack on Abu Suweir; however, with Egyptian command and control being inefficient as it was, no attempt was made to evacuate these bombers and they were lost during the second wave of attacks.

More action followed on 8th June when three EAF IL-28s (two of them were piloted by Maj. Hanfy Mahgoub and the same 1st Lt. el-Keraidy) bombed an Israeli camp on the road between Bir el-Abd and Romani in northern Sinai where an armoured convoy had paused on the march. One of the bombers was attacked and damaged by cannon fire from an IDF/AF Dassault Mirage IIICJ fighter but made it back to Cairo-West AB on one engine. Mahgoub's aircraft was shot down by the Mirages, and although the crew bailed out Mahgoub was listed MIA. On the way back el-Keraidy, who still had bombs left, attacked the Firdan Bridge spanning the Suez Canal at Ismailiya and scored a hit; yet the strategically important bridge did not collapse.

At the beginning of the hostilities the Syrian Air Force had the four IL-28Rs it had inherited from the

UARAF, only two of them being flyable. Two of the four were destroyed on the ground at al-Mezze AB by IDF/AF Dassault M.D.450 Ouragan fighter-bombers during the Six-Day War. Together with the 29 Egyptian examples, this brings the total number of IL-28s lost in this conflict to 31.

In February 1968 the IL-28 first put in an appearance in Vietnam when three *Beagles* were deployed to Fukien AB 30 km (18 miles) north-west of Hanoi. It was believed they were to support the large-scale Viet Cong offensive launched after the USA had stopped the first series of bombing attacks on Vietnam (the Tet Offensive), but the IL-28s did not participate in this operation. Normally the *Beagles* were based in southern China; if the US intelligence service reported the presence of these aircraft on any North Vietnamese airfield, the airbase would be pounded with cluster bombs loaded with pellets.

In 1971 the North Vietnamese IL-28s did see action, supporting the Vietnamese People's Army and the Pathet Lao guerrillas in Laos. Soviet airmen took part in these operations, too; pilot Berkutov and navigator Khachemizov were even awarded the Hero of the Vietnamese People's Army title.

In August 1968, 12 years after the Hungarian revolt, Soviet Air Force IL-28s were again involved in an operation to stomp out deviations from socialism, law and order – the invasion of Czechoslovakia to suppress the dissent headed by Alexander Dubček. Specifically, these were 7th FBAP bombers from Starokonstantinov and possibly IL-28R reconnaissance aircraft from Schchoochin (Belorussian MD). This time, however, there was no actual warfare.

Skirmishes between Israel and Egypt after the Six-Day War continued until 1970 during the War of Attrition, in which Egypt tried to force Israel to withdraw from the occupied Sinai Peninsula. Most of the fighting took place around the Suez Canal. EAF IL-28s participated actively in these clashes, flying reconnaissance and strike missions over Israeli-held territory. For example, on 25th April 1970 a pair of *Beagles* made a night raid against El Arish, destroying three buildings; however, both aircraft were intercepted and destroyed by IDF/AF fighters immediately afterwards. The first bomber was intercepted over the Mediterranean as it headed back to Egypt, and the pilot (the aforementioned Maj. Anis Khudayr) attempted a head-on cannon attack, but seconds later the bomber was hit by an AAM. Khudayr ejected at just 20 m (65 ft) and survived; navigator Mohammed Darwish and GRO Samir Girgis lost their lives. The other bomber was shot down into Lake Bardavil (which the Israelis call Lake Sirbon), with the loss of the entire crew – pilot Maj. Mohammed Abdel Gawad, navigator Capt. Saad Abdullah and the unidentified GRO. Two more IL-28s were shot down between 10th July and 1st August 1970.

A further example was lost in a 'friendly fire' incident in December 1969 or March 1970 when an IL-28 (some sources call it an IL-28U) towing a sleeve-type target was destroyed by an S-125 *Pe**cho**ra* (the name of a Russian river; NATO SA-3 *Goa*) SAM over Cairo-West AB; the missile site was manned by a Soviet crew under N. M. Kootyntsev. Of course a scandal erupted; to make matters worse one of the airmen who had perished in the shootdown (Flt. Off. Dorry Riyad Sakr) was a member

A camouflaged FNAF IL-28 shares the apron at Abuja with a MiG-17F.

Left and far left: The Nigerian IL-28s wore crudely hand-painted camouflage, and no two were identical.

of one of the Arab royal families. However, using the missile system's data recording equipment, Kootyntsev proved that the air defence crews had not been informed of the bomber's mission and the IL-28's IFF transponder was out of order. Furthermore, a group of four IDF/AF McDonnell Douglas F-4E Phantom IIs had crossed the Suez Canal, formating with the *Beagle*, then heading back unnoticed at ultra-low level. As a result, the missile team misidentified the IL-28 as the leader of an Israeli strike group and opened fire. The Egyptians had to admit the Soviet officer was right.

The final page of the Egyptian *Beagles*' combat career was the Holy Day War (or Yom Kippur War) of 6th-25th October 1973. During the Egyptians' opening assault known as Operation *Badr* ('full moon' in Arabic) two IL-28s flew a sortie against Fort Budapest – one of the Israeli fortifications on the Bar-Lev Line, bombing it even though the attack had been called off.

Iraqi Air Force IL-28s were used operationally in the late 1960s and in the first six months of 1974 in Saddam Hussein's relentless war with the Kurdish minority in northern Iraq which was striving for sovereignty. On 15th August 1962 there was an incident when a pair of Iraqi IL-28s due to attack Kurdish rebel targets strayed into Turkish airspace by mistake, attacking a village on the wrong side of the border. The Turks regarded this as an act of aggression, and when the Iraqi IL-28s crossed the border again in the same area the following day they were intercepted by four Turkish Air Force Republic F-84G Thunderjets of the two squadrons resident at Diyarbakir AB (the 181 *Filo* and 182 *Filo*). The fighters were quick to attack, and one of the pilots, Lt. Muretin Gül from the 181 *Filo*, shot down IL-28 '432' (c/n 56606540) near Hakkani; the bomber's crew ejected and was taken prisoner. The Kurdish rebels claimed one bomber shot down in April 1974.

In the late 1970s the Khmer Rouge regime of Kampuchean dictator Pol Pot used a handful of *Beagles* (probably Chinese-built H-5s) against the opposition forces headed by Heng Samrin who became head of the government after Pol Pot was ousted. One of the IL-28s was reportedly shot down; two more were captured intact at Pochentong AB near Phnom Penh on 7th January 1979 when the base was overrun by Vietnamese troops supporting the opposition.

An IL-28ZA with a cheatline taxies past an Aeroflot IL-18 at Moscow-Vnukovo airport in May 1960.

The Afghan War of 1979-89 was the last conflict in which the venerable bomber participated. Despite its age, it turned out to be well suited for this war thanks to its rugged dependability in the harsh conditions of Afghanistan with its ill-equipped airfields and pervasive dust. Unexpectedly, the seemingly archaic manned tail gunner's station turned out to be quite useful; the GRO would fire at enemy troops on the ground, discouraging attacks with shoulder-launched surface-to-air missiles. The efficiency of this tactic can be judged by the fact that not a single Afghan Air Force IL-28 was lost to the Mujahideen rebels' air defences. Still, the *Beagles* were lost one night in January 1985 in a way that was not uncommon during the Afghan War. Traitors among the Afghan personnel of Shindand AB who had been bought off by the rebels blew up eleven of the 335th Composite Air Regiment IL-28s.

In 1985 another Chinese IL-28 eloped, this time to South Korea. The crew was less lucky this time; the aircraft was totally destroyed while attempting a forced landing in a field, killing the GRO and a local farmer.

In Aeroflot service

in 1952 Air Marshal Semyon F. Zhavoronkov, the then Chief of GU GVF (***Glahv****noye oopravl****en****iye Grazh-****dahn****skovo voz****doosh****novo* ***flot****a* – the Main Directorate of the Civil Air Fleet, the most important component of Aeroflot Soviet Airlines), addressed the Air Force C-in-C Air Marshal Pavel F. Zhigarev, requesting that five IL-28s be transferred to Aeroflot for trial operation. He cited transportation of urgent mail and the need to give Aeroflot pilots their first taste of jet aircraft operations as the reason. The request was met, and in 1953 the first group of seven civil aviation pilots was formed in Aeroflot's Moscow Transport Aviation Directorate (MUTA – *Mos****kov****skoye oopravl****en****iye* ***trahns****portnoy avi****ah****tsii*) for conversion to the IL-28 whose demilitarised version was known in the Aeroflot system as the IL-20. Aleksandr Bystritskiy, Pyotr I. Devyatov, Leonid I. Yegorov, Garol'd D. Kuznetsov, Pavel M. Mikhaïlov, Konstantin P. Sapelkin and Viktor A. Filonov were all seasoned pilots with a wealth of experience earned in the war, and they would not be fazed by an unfamiliar machine with 'thunderpipes' instead of the customary propellers; later they would be known as 'The Magnificent Seven'. On 31st December 1953 they successfully received their type ratings on the IL-28 after taking their training at the 4th TsBP i PLS.

'We had a fairly good idea that our flights were to be a sort of stepping stone towards large-scale passenger transportation on fast aircraft – Leonid I. Yegorov reminisced – *We not only had to overcome a sort of psychological barrier, we also needed to learn new aviation terminology. Jet thrust, engine surge (aka compressor stall), aileron reversal, laminar flow, shock waves in the airflow, jet stream and a host of other*

IL-28ZA CCCP-36588 (c/n 54006104) shows details of the livery with a blue pinstripe below the cheatline.

Below: Aeroflot pilots – the first ones to convert to jets – pose with one of the airline's IL-20s (an IL-28U).

Bottom: IL-20 (IL-28U) registered CCCP-Л5404 (i.e., SSSR-L5404 in Cyrillic characters).

unfamiliar terms – we got to know what this means in the course of theoretical training and practice.'

The first four IL-20s were delivered to Aeroflot in 1954; three of these were in IL-28 configuration and one was an IL-28U trainer. Judging by the construction numbers, these were new-build aircraft; later, however, most of the demilitarised IL-28s, be it *Beagles* or *Mascots*, were aircraft from Air Force and AVMF stocks. For example, in August 1961 the Naval Aviation command ordered the transfer of eleven IL-28s from the Baltic Fleet, two from the Black Sea Fleet and 17 from the training outfit in Riga to Aeroflot. In so doing the military tried to foist some high-time aircraft with very little service life remaining on the civil aviators.

The first six IL-20s had the alphanumeric civil registrations CCCP-Л5401 through CCCP-Л5406 (that is,

SSSR-L5401 through SSSR-L5406 in Cyrillic letters), Under the pre-1958 Soviet registration system the letter following the CCCP- prefix was an operator designator – in this case, L for *lee**ne**ynyy samo**lyot*** (aircraft in airline service), denoting GU GVF.

In 1954 the IL-20 entered service on the Moscow – Sverdlovsk (this city in the Urals is now called Yekaterinburg) route, carrying urgent cargo and mail. The first results were encouraging, and soon the Aeroflot top brass took the decision to extend the jet mail route to Khabarovsk in the Far East.

The establishment of a squadron of 'civil jet bombers' was no whim. Firstly, even with refuelling stops, the IL-20 could deliver the mail from Moscow to Khabarovsk – a distance of 6,141 km (3,814 miles) as the crow flies – in eleven hours; this was three times faster than contemporary piston-engined aircraft and ten times faster than an express train. Consider that the mail included newspaper matrices which allowed fresh issues to be printed at the local printer's shops and get the papers to the media outlets on time; who wants yesterday's news?

Secondly, the Tupolev Tu-104 *Camel* – the first Soviet jet airliner – was under development, and pilots needed a multi-engine jet aircraft as a lead-in trainer. The IL-20 would expedite the Tu-104's service entry, which was to no small degree a matter of national prestige. This was an interesting job and a challenge for the pilots involved; for example, consider that during the landing approach decision had to be taken much faster due to the higher approach speed. (As an aside, one of The Magnificent Seven, Garol'd D. Kuznetsov, would later lose his life as captain of Tu-104 CCCP-42362 which crashed near Kanash, Chuvash ASSR, on 17th October 1958 after losing control in severe turbulence.)

Thirdly, the first group of pilots received another important assignment – it was tasked with air sampling at high altitudes (10,000-12,000m/32,810-39,370 ft). Therefore it was decided that Aeroflot should train its own jet aircraft pilots. Theoretical training was organised at Moscow-Vnukovo airport, where the first detachment of IL-20s would later be based, while flying practice took place in Leningrad at the airport then known as Shosseynaya (later renamed Pulkovo). The location was chosen both because the runway was long enough and because the military at nearby Pushkin airfield could lend various ground support equipment necessary for IL-20 operations. Leonid I. Yegorov was appointed instructor pilot. Thanks to the co-operation of the Aeroflot personnel at the airport, who were very supportive, the first group of trainees completed their training within a month without incident. Later they transitioned successfully to the Tu-104 and the four-turboprop IL-18 that took Aeroflot into the turbine era. As mentioned earlier, the IL-28ZA air sampling aircraft were converted *en masse* by the 256th ARZ in Siauliai.

For some reason the second new-build IL-20 in *Beagle* configuration, CCCP-Л5402 (c/n 54005777), was struck off charge with only 172 hours' total time since new, becoming an instructional airframe at the Ul'yanovsk Higher Civil Aviation Flying School at Ul'yanovsk-Baratayevka. The new-build IL-20 in *Mascot* configuration, CCCP-Л5404 (c/n 64007417), was similarly relegated to the Leningrad Civil Air Fleet Academy.

Apart from the first six aircraft, most IL-20s and IL-28ZA weather reconnaissance aircraft had post-1958 five-digit registrations in the CCCP-36xxx and CCCP-63xxx blocks. The Aeroflot 'order of battle' closely resembled the Air Force order of battle, with territorial Civil Aviation Directorates (UGA – *Oopravl**eni**ye Grazh**dahn**skoy avi**aht**sii*) similar to Military Districts; there were several of these in the Russian Federation and one for each of the other Soviet republics. In each CAD there were United Air Detachments (UADs, or OAO – *obyedi**nyon**nyy **a**viaot**ryad***) similar to air divisions; these consisted of Flights (LO – ***lyot**nyy ot**ryad***) which, in turn consisted of one to four squadrons. The IL-20 and IL-28ZA are known to have served with the following Aeroflot units:

- North Caucasian CAD/Rostov UAD/77th Flight, Rostov-on-Don;
- Georgian CAD/Tbilisi UAD/112th Flight, Tbilisi-Lochini airport;
- Urals CAD/1st Sverdlovsk UAD/120th Flight, Sverdlovsk-Kol'tsovo airport;
- Kazakhstan CAD/Aktyubinsk UAD/153rd Flight, Aktyubinsk;
- Moscow Transport CAD/Vnukovo UAD/200th Flight, Moscow-Vnukovo airport (until early 1957);
- East Siberian CAD/1st Irkutsk UAD/201st Flight, Irkutsk-1 airport;
- Far Eastern CAD/Khabarovsk UAD/202nd Flight, Khabarovsk-Novyy airport;
- Uzbekistan CAD/Tashkent UAD/203rd Flight, Tashkent-Yoozhnyy (= South) airport;
- West Siberian CAD/Tolmachovo UAD/204th Flight, Novosibirsk-Tolmachovo airport;
- Ukrainian CAD/Borispol' UAD/208th Flight, Kiev-Borispol' airport;
- Kazakhstan CAD/Alma-Ata UAD/227th Flight, Alma-Ata.

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The IL-28 has been aptly described by one Russian author as 'a successful design that was out of luck'. Even though the IL-28's combat potential was not used to the full, it was this type that introduced jet aircraft and all-weather capability to the bomber element of the Soviet Air Force and several other air arms. The IL-28 helped to train hundreds of first-rate naval pilots. Western aviation experts gave the *Beagle* due credit, describing it as a masterpiece of Soviet aircraft design.

CHAPTER SEVEN

Beagles worldwide

The IL-28 was operated by 25 nations in various parts of the world. In this chapter, an attempt has been made to list all identified aircraft.

Soviet Union

The Soviet Union was the first, and largest, operator of the type. Unfortunately, because of the system of tactical codes described earlier the only way of positively identifying an aircraft is by the construction number; hence the following tables listing Soviet military *Beagles* and *Mascots* is in construction number order. In the case of Moscow-built aircraft the batch number is relevant, as even under the same c/n system the first digit may vary according to the version. A few aircraft with unknown c/ns are included if more or less positively identified by the unit they belonged to or other relevant details. So far, very few IL-28s with pre-1955 serials have been identified; such serials are given in bold type in the tables below.

The **Soviet Air Force (VVS)** is dealt with first, being the primary operator. As mentioned in Chapter 6, the type saw service with such bomber units as the 45th, 173rd and 224th BAPs of the 56th *Breslavskaya* TBAD at Migalovo AB; the 230th FBAP (Cherlyany AB) and 408th FBAP of the 63rd BAD of the 57th VA; the 654th GvBAP, 748th GvBAP and 819th GvBAP of the 164th GvBAD at Zaporozhye-Mokraya AB; three regiments of the 132nd BAD, including the 4th GvBAP at Chernyakhovsk. Some units were stationed abroad, such as the 207th, 221st and 668th FBAPs of the 166th BAD in East Germany, or the 131st, 1101st and 1107th BAPs of the 183rd BAD in Poland. Reconnaissance units included the 47th GvORAP at Migalovo AB, the 98th GvORAP at Monchegorsk and the 882nd ORAP; training units included the 59th UAP of the Barnaul Military Pilot College (BVVAUL).

Known examples are listed in the tables; unfortunately in many cases only the c/n is known but not the serial or tactical code. Some of

An IL-28U with the unusually high tactical code '100 Red' which is repeated on the tail in black. The star has weathered away almost completely.

Known Soviet Air Force IL-28s

C/n	Serial or code	Version	Notes
a) Moscow production (plant No.30)			
50300906	?	IL-28	Operated by LII; damaged in crash landing Zhukovskiy 19-5-1953
50301408	?	IL-28	
51301801	?	IL-28	Year in c/n out of sequence; Ilyushin OKB, development aircraft, used for testing various improvements. To AVMF, see next table
50301905	?	IL-28	
530512007	?	IL-28	Ilyushin OKB; development aircraft, used for brake parachute tests
430512301	?	IL-28R	Prototype, Ilyushin OKB; also reported as IL-28RM prototype
530512602	?	IL-28	
530512603	?	IL-28	Ilyushin OKB; development aircraft, used for ADF installation tests
630513001?	?	IL-28U	C/n reported as 63001
62003501?	?	IL-28U	C/n reported as 63501
52003701	?	IL-28	VK-5 powered version/first prototype, Ilyushin OKB; reported in error as IL-28RM
52003714	no serial	IL-28RM	Prototype, Ilyushin OKB
52003719	**17**	IL-28	VK-5 powered version/second prototype, Ilyushin OKB; reported in error as IL-28RM
52003821	?	IL-28	Ilyushin OKB; development aircraft, used for ADF installation tests
53004107?	3 Red	IL-28	
53004704	03	IL-28	
53005005	?	IL-28	
53005112	12 Red	IL-28LSh	Ilyushin OKB, skid landing gear testbed
54005217	38 Red	IL-28	Year in c/n out of sequence – delivered late? Also reported as c/n 53005217, which is in sequence
53005239	34	IL-28	
63005678?	14	IL-28U	ChVVAUSh; c/n off photo but not 100% sure
53005706	?	IL-28	To Finnish Air Force 28-1-1960 as NH-1
53005710	**710 Blue**	IL-28LL	LII, ejection seat testbed, TOC* 1953. Became, see next line
	10 Blue	IL-28LL	LII, ejection seat testbed, recoded after 1955. SOC* 1978
53005771	04 Blue	IL-28	Preserved Soviet Air Force Museum (Central Russian Air Force Museum), Monino; later as '04 Red'
54005879	?	IL-28	To 712th ARZ, Chelyabinsk
54005917	?	IL-28BM	GSVG/65th OBAE, based Damgarten until 1985
54005975	23	IL-28	To Kirsanov Civil Aviation Tech School as GIA*
54005979	?	IL-28	Operated by unidentified VVAUL
54006021	68	IL-28	
54006231	no code	IL-28PP	Prototype of version with wingtip ECM pods.
54006275	31	IL-28	BVVAUL/59th UAP, based Slavgorod
54006279	?	IL-28	GSVG/11th ORAP. To East German Air Force ?-1962 as 205 Black
63006305?	01 Blue	IL-28U	GSVG/65th OBAE, based Damgarten AB until 1985. C/n as reported but year in c/n too low!
54006327?	62 Red	IL-28	Batch number not 100% sure, c/n off photo
5400635...	21 Blue	IL-28	Last digit of c/n not readable. Preserved Kirovograd near the Ukraine State Flight Academy until at least 3-2008 but gone by 2015
55006417	?	IL-28	GSVG/11th ORAP. To East German Air Force ?-1962 as 226 Black
55006424	26 Blue	IL-28	
55006445	?	IL-28	GSVG/11th ORAP. To East German Air Force ?-1962 as 224 Black
55006448	?	IL-28	GSVG/11th ORAP. To East German Air Force ?-1962 as 208 Black
55006542	11 Red	IL-28BM	GSVG/65th OBAE, based Oranienburg AB (1972-77) and Damgarten AB (1977-85)
55006664	60	IL-28	ChVVAUSh
55006817	07 Red	IL-28	
64006908	35	IL-28U	4th GvBAP; sometimes reported in error as c/n 64006968 (see this batch/number combination a few lines down!). To Aeroflot
55006934	?	IL-28	
55006937	?	IL-28	GSVG/11th ORAP. To East German Air Force ?-1959 as 190 Black
55006944	?	IL-28	GSVG/11th ORAP. To East German Air Force ?-1959 as 196 Black
55006962	31	IL-28	Based Novgorod-Krechevitsy AB
55006968	03 Blue	IL-28	
55007155	06 Red	IL-28BM	GSVG/65th OBAE, based Damgarten AB 1972-77
55007160	10 Red	IL-28BM	GSVG/65th OBAE, based Damgarten AB 1972-77
55007170	35 Blue	IL-28	Two small ventral blisters on bomb bay doors

64007202	?	IL-28U	4th GvBAP. To Aeroflot 12-1960
64007602	20 Red	IL-28U	
64007603	18	IL-28U	
65009520	?	IL-28U	To Iraqi Air Force as 422
55009601?	07 Red	IL-28?	GSVG/65th OBAE, target tug, based Damgarten AB until 1985; c/n reported in error as 56009601. Also reported as IL-28U c/n 65009601
65009706	42 Blue	IL-28U	
65009807	100 Red	IL-28U	
65009808	?	IL-28U	To Iraqi Air Force as 421
65010102?	96 Red	IL-28U	
65010219	19	IL-28U	Based Zhukovskiy
65010311	?	IL-28U	To East German Air Force ?-1961 as 193 Black
65010518	76	IL-28U	BVVAUL/59th UAP, based Slavgorod
65010809	09	IL-28U	Based Zhukovskiy
...501	**501 Blue**	IL-28U-LL	LII, ejection seat testbed; c/n 5030...501 or 63051...501
b) Voronezh production (plant No.64)			
6450001	?	IL-28	
6450301	?	IL-28	
2401403	no serial	IL-28	Damaged Voronezh-Pridacha 11-5-1952 in landing accident (probably DBR)*
2401501	?	IL-28	Relocated ADF
2402101	01 Red	IL-28	LII, in-flight refuelling system testbed (tanker)
3402209	12 Blue	IL-28	
3402220	12 Blue?	IL-28	
3402701	?	IL-28	
4404017	22 Blue	IL-28	GSVG/65th OBAE, target tug, based Damgarten AB until 1985; reported in error as c/n 44004017, but year of production and batch number don't match (1954 is too late for the Moscow-built Batch 040!)
4404426	?	IL-28	To East German Air Force 12-1-1962 as 204 Black
5405811	22	IL-28	To Kirsanov Civil Aviation Tech School as GIA
5405917	?	IL-28	GSVG/65th OBAE, based Damgarten AB
5406005	?	IL-28	1114th BAP. Crashed 11-9-1959
c) Omsk production (plant No.166)			
0016601	?	IL-28	
0316603	?	IL-28	Manufacture date 28-1-1951. SOC and tested to destruction during fatigue tests in 1955, TTSN* 437 hrs 15 min; c/n in test report as 031663
0416601	?	IL-28	
1316601	?	IL-28	Relocated ADF
26603001	?	IL-28	Relocated ADF
36603509	?	IL-28	
36603513	?	IL-28	
36603608	01	IL-28	Preserved Arkhangel'skoye
36603807	01 Red	IL-28	Preserved Moscow-Khodynka museum, later to Vadim Zadorozhnyy Technical Museum
46605214	16	IL-28	
56605505	43 Red	IL-28	BVVAUL/59th UAP, based Slavgorod
56605702?	33 Red	IL-28	Preserved Civil Aviation Museum, Ul'yanovsk, as 'IL-20' (no tactical code, Soviet flag on tail, Aeroflot logo on fuselage); c/n also reported as 56606702!
56605703	?	IL-28	To Iraqi Air Force as 425
56605704	?	IL-28	To Iraqi Air Force as 426
56605717	?	IL-28	To Iraqi Air Force as 427
56606111	35	IL-28	To Aeroflot as IL-28ZA
56606201	85 Blue	IL-28	Became, see next line
	01 Red		Preserved/GIA Kuibyshev Aviation Institute (KuAI)†
56606206		IL-28	To Iraqi Air Force as 430
56606207		IL-28	To Iraqi Air Force as 434
56606540		IL-28	To Iraqi Air Force as 432

d) Kuibyshev production (plant No.1)			
1500001	?	IL-28	
e) Irkutsk production (plant No.39)			
3900101	?	IL-28R	
4900508	?	IL-28R	GK NII VVS
4900813	?	IL-28R	GK NII VVS
5901409	?	IL-28R	Converted to, see next line
		IL-28RBN	
5901106	?	IL-28R	To Finnish Air Force as NH-4
5901211	?	IL-28R	Converted to, see next line
		IL-28RBN	
5901703	?	IL-28R	To Iraqi Air Force as 564
5901710	?	IL-28R	To Finnish Air Force 23-6-1961 as NH-2
5901713	?	IL-28R	To Finnish Air Force as NH-3
5901801	?	IL-28R	To Iraqi Air Force as 565
f) unknown factories			
...211	**211 Blue**	IL-28	LII
...418	?	IL-28	LII, IFR system testbed (tanker)
...708	**708 Blue**	IL-28	LII, crew escape system testbed
...803	**803 Red**	IL-28LL	Became, see next line
	03 Red	IL-28	LII, rocket motor testbed
?	01 Blue/6	IL-28	LII, avionics testbed with wingtip equipment pods
?	2 Red	IL-28-131	Prototype?
?	08 Blue	IL-28	57th VA/63rd BAD/408th FBAP, Cherlyany AB, 1957
?	08 Red	IL-28	LII, IFR system testbed (receiver aircraft)
?	16 Red	IL-28	C/n reported in error as 65010809, which see. Became, see next line
	10 Red		Preserved Central Armed Forces Museum, Moscow (now as '10 Red outline')
?	19 Red	IL-28Sh	
?	22 Red	IL-28	Preserved *Rígas Aviacijas Múzejs*, Riga-Spilve
?	21 Red	IL-28Sh	
?	25 Red	IL-28Sh	
?	29 Red	IL-28Sh	
?	30 Red	IL-28	Preserved as gate guard at a Russian airbase

* TOC = taken on charge, SOC = struck off charge; GIA = ground instructional airframe; DBR = damaged beyond repair; TTSN = total time since new † Now Samara State Aviation University (SGAU)

these aircraft may actually be Navy aircraft – especially since entire regiments, such as the 819th BAP, were transferred from the Air Force to the Naval Aviation.

The second Soviet operator of the type as regards both timeline and scale of operations was the **Naval Aviation (AVMF)**. The IL-28 *sans suffixe* conventional bomber, the IL-28N nuclear-capable bomber and the IL-28T torpedo-bomber, as well as the IL-28R reconnaissance version (and, of course, the IL-28U trainer), saw service with all four Soviet Navy fleets – the Baltic Fleet, the Black Sea Fleet, the Pacific Fleet and the North Fleet (entering service in that order). Naval IL-28 units included the Baltic Fleet's 1531st GvMTAP and 759th MTAP, the Black Sea Fleet's 1675th, 1676th and

Right: A bulky 3,000-kg bomb is towed to the hardstand on a dolly by a GAZ-63 4x4 army lorry for loading into an IL-28.

Far right: The same bomb is hoisted into the bomb bay.

Known Soviet Naval Aviation IL-28s			
C/n	**Serial or code**	**Version**	**Notes**
a) Moscow production (plant No.30)			
50301104	no serial	IL-28T	Second prototype, Ilyushin OKB
50301106	no serial	IL-28T	First prototype, Ilyushin OKB. Later serialled '**4 Red**'. Converted to, see next line
	4 Red	IL-28TM	Prototype, Ilyushin OKB
50301408	?	IL-28T	
51301801	?	IL-28	Pacific Fleet/3rd MTAD/1535th MTAP; reported in error as c/n 50301801. Crashed 15-2-1955
53004702	?	IL-28T	Version with RAT-52 torpedo carried internally
53004705	?	IL-28T	Version with RAT-52 torpedo carried internally
53005130	11 Red	IL-28	Black Sea Fleet/819th MTAP?
53005717?	09 Red	IL-28T	Nikolayev Minelayer & Torpedo-Bomber Flying School
53005574	?	IL-28T?	Pacific Fleet? Transferred to PLANAF as 80002
55006571	?	IL-28T?	Pacific Fleet? Transferred to PLANAF as 82025
55006728	24 Red	IL-28N	Pacific Fleet/89th MTAD/567th GvMTAP. Crashed on Livadia mountain range, Primor'ye Territory, 28-8-1959, crew killed
65010202	?	IL-28U	Pacific Fleet/50th GvORAP. Crashed near Novorossiya-West AB 7-12-1956, crew killed
b) Voronezh production (plant No.64)			
4404148	**22 Blue**	IL-28T	NII AVMS (NII-15 VMS), Riga, development aircraft with two external torpedo racks and modified nose glazing
c) Omsk production (plant No.166)			
0316601	?	IL-28T	Manufacture date 30-12-1950. SOC and tested to destruction during fatigue tests in 1955, TTSN* 394 hrs 08 min; c/n in test report as 031661
56606005?	?	IL-28	Crashed Mt. Chasnachorr, Khibiny Mts (Murmansk Region), so probably a North Fleet aircraft; date unknown. Wreckage found 1971 with 56005 stencilled on many fragments, full c/n cannot be 54006005 (see IL-20 CCCP-36582 No.1 below!) or 5406005 (see VVS table!)
d) Kuibyshev production (plant No.18)			
3800109	?	IL-28T	Pacific Fleet/3rd MTAD/1535th MTAP. Crashed 15-2-1955, crew killed; location not found until the 1990s
e) Irkutsk production (plant No.39)			
5901314	?	IL-28R	Pacific Fleet/50th GvORAP. Crashed 1-4-1958, crew killed
f) unknown factories			
...4702	?	IL-28T	Full c/n 52004702 or 46604702
...4705	?	IL-28T	Full c/n 52004705 or 46604705
?	7 Red	IL-28T	Pacific Fleet/567th MTAP

1817th MTAPs, the Pacific Fleet's 567th GvMTAP and 568th MTAP, the North Fleet's 574th MTAP and 924th GvMTAP. The Navy's reconnaissance units included the North Fleet's 1733rd ORAP, the Baltic Fleet's 15th ODRAP and the Pacific Fleet's 50th GvODRAP.

Finally, the demilitarised IL-20 mailplane and IL-28ZA air sampling version saw service with **Aeroflot Soviet Airlines**. Virtually all of them were second-hand aircraft; however, with very few exceptions it is not known whether they came from VVS or AVMF stocks,

Aeroflot IL-20 mailplanes and IL-28ZA air sampling aircraft			
Registration	**Version ***	**C/n**	**Notes**
CCCP-Л2035?	IL-20 (IL-28)	?	I.e., SSSR-L2035; existence not confirmed
CCCP-Л5401	IL-20 (IL-28)	54005775	Delivered new 1954, natural metal overall
CCCP-Л5402	IL-20 (IL-28)	54005777	Delivered new 1954, natural metal overall. To UVAUGA † as instructional airframe, TTSN 172 hours
CCCP-Л5403	IL-20 (IL-28)	54005779	Delivered new 1954, natural metal overall
CCCP-Л5404	IL-20 (IL-28U)	64007417	Delivered new 1954, natural metal overall
CCCP-Л5405	IL-20 (IL-28R)	6901919	To OLAGA † as instructional airframe
CCCP-Л5406	IL-20 (IL-28R)	6901920	Crashed 9-12-1960, crew killed

CCCP-36580 No.1	IL-28ZA (IL-28)	46605219	Far Eastern CAD/Khabarovsk UAD/202nd Flight, TOC 18-7-1960, natural metal overall. DBR Khabarovsk-Novyy 13-1-1963 in ground collision with CCCP-36581, SOC 19-4-1963 ‡; registration reused in 1965 for Yak-18A c/n 1161303, Kremenchug VLUGA †
CCCP-36581 No.1	IL-28ZA (IL-28)	56605517	Far Eastern CAD/Khabarovsk UAD/202nd Flight, TOC 18-7-1960, natural metal overall. DBR Khabarovsk-Novyy 13-1-1963 in ground collision with CCCP-36580, SOC 19-4-1963; registration reused in 1965 for Yak-18A c/n 1161221, Kremenchug VLUGA
CCCP-36582 No.1	IL-20 (IL-28U)	63006005	North Caucasian CAD/Rostov UAD/77th Flight, TOC 24-11-1960. SOC 30-12-1964 as worn out; registration reused in 1965 for Yak-18A c/n 1161229, Buguruslan VLUGA
CCCP-36583 No.1	IL-28ZA (IL-28)	2400908	Ukrainian CAD/Borispol' UAD/208th Flight, TOC 26-10-1960. SOC 26-5-1962 as time-expired; registration reused in 1965 for Yak-18A c/n 1161204, Buguruslan VLUGA
CCCP-36584 No.1	IL-28ZA (IL-28)	3403220	Moscow Transport Aviation Directorate (MUTA)/200th Flight, TOC 17-8-1960. SOC 5-2-1963; registration reused in 1965 for Yak-18A c/n 1161302, Buguruslan VLUGA
CCCP-36585 No.1	IL-28ZA (IL-28)	3403220	MUTA/200th Flight, TOC 15-10-1960. To Krasnoye Sormovo Shipyard, Gor'kiy, SOC 30-12-1964; registration reused in 1965 for Yak-18A c/n 1161312, Buguruslan VLUGA
CCCP-36586 No.1	IL-28ZA (IL-28)	3403106	Georgian CAD/Tbilisi UAD/112th Flight. SOC by 1965, registration reused in 1965 for Yak-18A c/n 1161411, Buguruslan VLUGA
CCCP-36587 No.1	IL-28ZA (IL-28)	3402918	Georgian CAD/Tbilisi UAD/112th Flight, TOC 1-7-1960. To 712th ARZ 8-7-1964, SOC 30-12-1964, registration reused in 1965 for Yak-18A c/n 1161826, Buguruslan VLUGA
CCCP-36588 No.1	IL-28ZA (IL-28)	54006104	MUTA/200th Flight, blue cheatline with red pinstripe. SOC by 1965, registration reused in 1965 for Yak-18A c/n 1161827, Buguruslan VLUGA
CCCP-36589 No.1	IL-28ZA (IL-28)	52003707	Kazakhstan CAD/Aktyubinsk UAD/153rd Flight, TOC 15-12-1959. SOC 14-11-1962 as worn out; registration reused in 1965 for Yak-18A c/n 1162207, Buguruslan VLUGA
CCCP-36590 No.1	IL-28ZA (IL-28)	36603309	Uzbekistan CAD/Tashkent UAD/203rd Flight. SOC 15-4-1961; registration reused in 1965 for Yak-18A c/n 1162209, Buguruslan VLUGA
CCCP-36591 No.1	IL-28ZA (IL-28)	53005451	Ukrainian CAD/Borispol' UAD/208th Flight. SOC 7-8-1961 as time-expired; registration reused in 1965 for Yak-18A c/n 1162524, Buguruslan VLUGA
CCCP-36592 No.1	IL-28ZA (IL-28)	53005415	North Caucasian CAD/Rostov UAD/77th Flight, TOC 7-12-1959. SOC 30-1-1963 as time-expired; registration reused in 1965 for Yak-18A c/n 1160912, Buguruslan VLUGA
CCCP-36593 No.1	IL-28ZA (IL-28)	54006170	East Siberian CAD/1st Irkutsk UAD/201st Flight. SOC 14-11-1962 as worn out; registration reused in 1965 for Yak-18A c/n 1161118, Kremenchug VLUGA
CCCP-36594	IL-28ZA (IL-28)	530512911	Kazakhstan CAD/Alma-Ata UAD/227th Flight. SOC 19-6-1961 as time-expired
CCCP-36595	IL-28ZA (IL-28)	54005947	Far Eastern CAD/Khabarovsk UAD/202nd Flight
CCCP-36596	IL-28ZA (IL-28)	36603301	West Siberian CAD/Tolmachovo UAD/204th Flight
CCCP-36598	IL-28ZA (IL-28)	53005450	Urals CAD/1st Sverdlovsk UAD/120th Flight. SOC 31-7-1961 as time-expired
CCCP-36599	IL-28ZA (IL-28)?	530512803?	MUTA/200th Flight. C/n also reported as 630512803, i.e. IL-20 (IL-28U)
CCCP-63920	IL-20 (IL-28U)	64007408	MUTA/200th Flight, TOC 16-11-1960. To 712th ARZ in 1964, SOC 30-12-1964
CCCP-63921	IL-28ZA (IL-28)	54006138	Georgian CAD/Tbilisi UAD/112th Flight. SOC 20-2-1963 as time-expired
CCCP-63922	IL-28ZA (IL-28)	3403107	Georgian CAD/Tbilisi UAD/112th Flight, TOC 1-12-1961. To 712th ARZ 25-6-1964, SOC 30-12-1964
CCCP-63923	IL-28ZA (IL-28)	56606118	West Siberian CAD. To 358th ARZ in 1964, SOC 30-12-1964
CCCP-63924	IL-28ZA (IL-28)	54006025	East Siberian CAD/1st Irkutsk UAD/201st Flight, TOC 1-11-1961. To 712th ARZ 15-7-1964, SOC 30-12-1964
CCCP-63925	IL-28ZA (IL-28)	56606111	Kazakhstan CAD/Alma-Ata UAD/227th Flight; ex-Soviet Air Force '35', TOC 29-9-1961. To 712th ARZ in 1964, SOC 30-12-1964
CCCP-63926	IL-20 (IL-28U)	63006201	East Siberian CAD/1st Irkutsk UAD/201st Flight, TOC 6-3-1962. To 358th ARZ in 1964, SOC 30-12-1964
CCCP-63927	IL-20 (IL-28U)	63005811	Uzbekistan CAD/Tashkent UAD/203rd Flight, TOC 13-3-1962. To 712th ARZ 1-7-1964, SOC 30-12-1964
CCCP-63928	IL-28ZA (IL-28)	4403717	Ukrainian CAD, TOC 26-4-1962. To 358th ARZ in 1964, SOC 30-12-1964
CCCP-63929	IL-28ZA (IL-28)	36604203	Kazakhstan CAD/Alma-Ata UAD/227th Flight, TOC 26-3-1962. To 712th ARZ in 1964, SOC 30-12-1964
CCCP-63930	IL-28ZA (IL-28)	3403116	Urals CAD, TOC 26-4-1962. To 712th ARZ 15-6-1964, SOC 30-12-1964
CCCP-63931	IL-28ZA (IL-28)	56605705	Urals CAD, TOC 26-4-1962. To 712th ARZ 25-6-1964, SOC 30-12-1964
CCCP-63932	IL-28ZA (IL-28)	530523018	Strange year in c/n (late acceptance?) Uzbekistan CAD/Tashkent UAD/203rd Flight, TOC 17-9-1962. To 712th ARZ 1-7-1964, SOC 30-12-1964
CCCP-63933	IL-28ZA (IL-28)	53005223	Uzbekistan CAD/Tashkent UAD/203rd Flight, TOC 1-10-1962. To 712th ARZ in 1964, SOC 30-12-1964
CCCP-63934	IL-28ZA (IL-28)	4404117	MUTA/200th Flight, TOC 1-6-1962. To Krasnoye Sormovo Shipyard, SOC 30-12-1964
CCCP-63935	IL-28ZA (IL-28)	53005723	MUTA/200th Flight, TOC 1-10-1962. To Krasnoye Sormovo Shipyard, SOC 30-12-1964
CCCP-63936	IL-28ZA (IL-28)	46604809	MUTA/200th Flight, TOC 27-4-1962. To Krasnoye Sormovo Shipyard, SOC 30-12-1964
CCCP-63937	IL-28ZA (IL-28)	54006017	Ukrainian CAD, TOC 23-8-1962. To 358th ARZ 15-7-1964, SOC 30-12-1964
CCCP-63938	IL-28ZA (IL-28)	530052040?	*Sic* – c/n reported as such but must be 53005204 or 53005240! North Caucasian CAD, TOC 20-2-1962. To 712th ARZ in 1964, SOC 30-12-1964
CCCP-63939	IL-28ZA (IL-28)	46605019	Georgian CAD, TOC 1-10-1962. To 712th ARZ 6-6-1964, SOC 30-12-1964
CCCP-63940	IL-28ZA (IL-28)	3402628	West Siberian CAD, TOC 27-4-1962. To 712th ARZ in 1964, SOC 30-12-1964
CCCP-63941	IL-28ZA (IL-28)	56605818	East Siberian CAD, TOC 17-6-1962. To 358th ARZ in 1964, SOC 30-12-1964
CCCP-63942	IL-28ZA (IL-28)	3403602	East Siberian CAD, TOC 8-10-1962. To 358th ARZ in 1964, SOC 30-12-1964
CCCP-63943	IL-28ZA (IL-28)	46605415	Kazakhstan CAD/Alma-Ata UAD/227th Flight, TOC 19-10-1962. To 712th ARZ in 1964, SOC 30-12-1964
CCCP-63944	IL-28ZA (IL-28)	53005016	Urals CAD; returned to the Air Force 4-7-1964, SOC 30-12-1964
CCCP-63945	IL-28ZA (IL-28)	1501017	North Caucasian CAD, TOC 3-6-1962. To 712th ARZ 20-6-1964, SOC 30-12-1964
CCCP-63946	IL-28ZA (IL-28)	46605209	Uzbekistan CAD/Tashkent UAD/203rd Flight, TOC 29-11-1962. To 712th ARZ in 1964, SOC 30-12-1964
CCCP-63947	IL-28ZA (IL-28)	3402702	West Siberian CAD; ex-Soviet Air Force '30', TOC 27-4-1962. To 358th ARZ in 1964, SOC 30-12-1964

CCCP-63948	IL-28ZA (IL-28)	54005980	Ukrainian CAD, TOC 10-8-1962. To 358th ARZ in 1964, SOC 30-12-1964
CCCP-63949	IL-28ZA (IL-28)	46604417	Far Eastern CAD, TOC 6-10-1962. To 358th ARZ 6-6-1964, SOC 30-12-1964
CCCP-63950	IL-28ZA (IL-28)	46605411	North Caucasian CAD, TOC 21-9-1962. To 712th ARZ in 1964, SOC 30-12-1964
CCCP-63951	IL-28ZA (IL-28)	56605913	Kazakhstan CAD/Alma-Ata UAD/227th Flight, TOC 25-10-1962. To 712th ARZ in 1964, SOC 30-12-1964
CCCP-63952	IL-20 (IL-28U)	?	East Siberian CAD, TOC 28-6-1963. To 358th ARZ in 1964, SOC 30-12-1964. C/n reported as 63000522 but the batch number (005) is too low for this c/n system
CCCP-63954	IL-28ZA (IL-28)	46604911	Far Eastern CAD, TOC 20-4-1963. To 358th ARZ 6-6-1964, SOC 30-12-1964
CCCP-86692 No.1	IL-28ZA (IL-28)	46605004	MUTA/200th Flight, TOC 26-1-1963. To Krasnoye Sormovo Shipyard, SOC 30-12-1964, registration reused in 1972 for IL-62M c/n 11102
CCCP-?????	IL-28ZA (IL-28)	54005879	Transferred from a military pilot college in 1963
CCCP-?????	IL-20 (IL-28U)	64006908	Uzbekistan CAD/Tashkent UAD/203rd Flight; ex-Soviet Air Force '35'
CCCP-?????	IL-20 (IL-28U)	64007202	East Siberian CAD/1st Irkutsk UAD/201st Flight; ex-4th GvBAP aircraft, probably no registration yet. Crashed near Novosibirsk 9-12-1960 on delivery flight from Chernyakhovsk AB, crew killed

* The original military version is given in parentheses

† UVAU GA = *Ool'**yah**novskoye **vys**sheye aviatsi**on**noye oo**chil**ishche Grazh**dahn**skoy avi**aht**sii* – Ul'yanovsk Higher Civil Aviation Flying School; OLAGA = ***or**dena **Len**ina Aka**dem**iya Grazh**dahn**skoy avi**aht**sii* – [Leningrad] Civil Aviation Academy awarded the Order of Lenin; VLUGA = ***vys**sheye **lyot**noye oo**chil**ishche Grazh**dahn**skoy avi**aht**sii* – (such-and-such) Higher Civil Aviation Flying School

which is why they are not listed in the two tables above. This part of the list is in registration order.

* * *

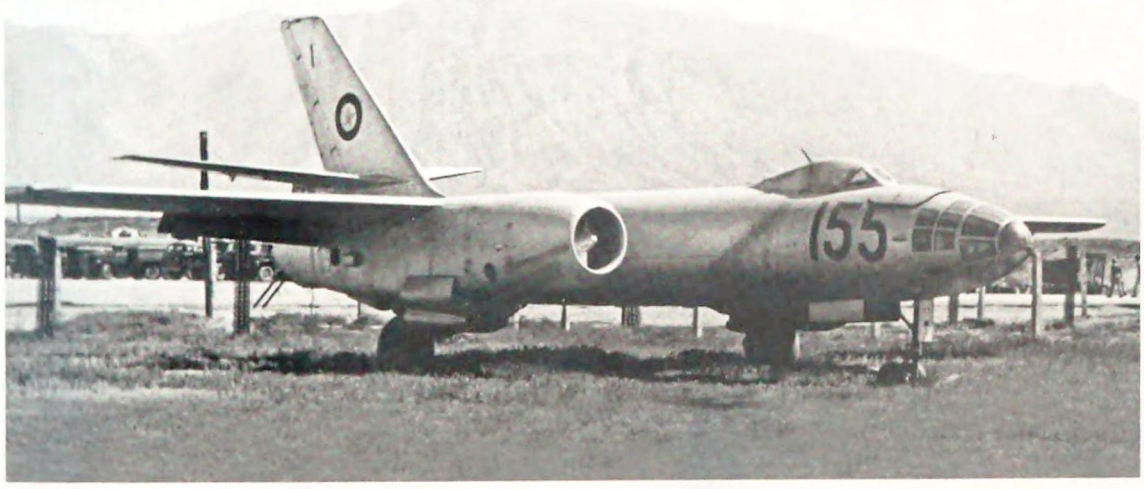
The type was exported in large numbers; according to some sources, more than 1,500 IL-28s were supplied to foreign customers in Europe, Asia, Africa and Central America. In addition to new-build aircraft, second-hand *Beagles* and *Mascots* from Soviet Air Force/Soviet Navy stocks were also exported, which saved them from being broken up prematurely. Non-Soviet operators of the IL-28 are listed below in alphabetical order.

Afghanistan

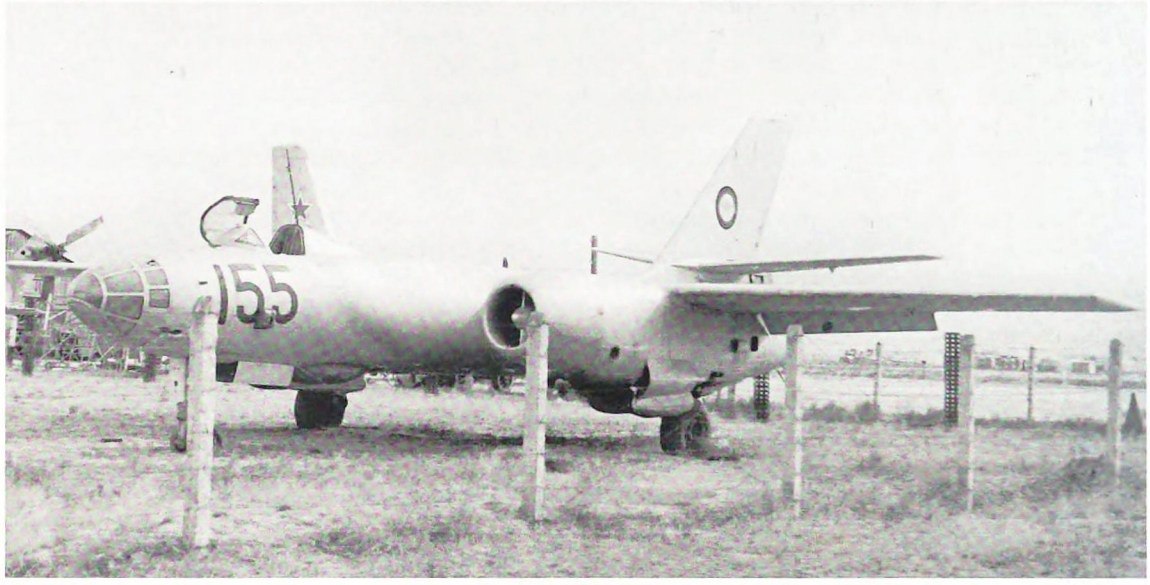
When Afghanistan was still a kingdom it was on sufficiently good terms with the Soviet Union to receive military aid, including deliveries of military aircraft to the **Royal Afghan Air Force** (*Afghan Nero-e-Hawa*) – albeit these were usually obsolescent aircraft being phased out by the Soviet Air Force. Thus, a number of IL-28 bombers and IL-28U trainers from Soviet stocks were delivered to the Royal Afghan Air Force in 1969. Reports on the number of aircraft supplied vary considerably, ranging from 12 aircraft (enough to equip a single squadron) to 45 aircraft (three squadrons).

When the last King of Afghanistan, Mohammed Zahir Shah, was deposed on 17th July 1973 and the Republic of Afghanistan headed by President Mohammad Daoud Khan (the former Royal Prime Minister) was proclaimed, the air arm became known as the **Afghan Republican Air Force**. After the April Revolution of 1978 (aka the Saur Revolution), in which President Daoud Khan was assassinated and a communist government headed by Hafizulla Amin was installed, the air arm changed its title again to the **Democratic Republic of Afghanistan Air Force** (DRAAF). Accordingly, like the other Afghan military aircraft, the IL-28s were taken over by these air arms.

The *Beagles* were mostly based at Mazar-e-Sharif where most of the Soviet military advisors were stationed. A number of IL-28s were operated by a squadron of the 335th Composite Air Regiment at Shindand AB in the summer of 1979.



Âfghan Air Force IL-28 '155' parked on the grass and apparently withdrawn from use. Note the slightly open navigator's entry hatch and the dirt on the forward fuselage.



Another view of the same IL-28 parked in company with a Mi-24 helicopter and a Soviet Air Force An-26 or An-30B.

The IL-28s were used operationally by the DRAAF at the opening stages of the Afghan Civil War (i.e., prior to the Soviet involvement) – and after the Soviet invasion in December 1979. Col. Valeriy I. Ablazov (Retd.), a former Soviet military advisor in Afghanistan, recalled, *'When we arrived in Afghanistan and saw MiG-17s and IL-28s taking off at the local bases, it was like travelling several decades back in a time machine. Here, these types turned out to be the best choice for operations both in the mountains and in the desert. The pilots and tech staff for them were trained by the local flying school. [...] The MiG-17s were used as interceptors for the air defence system and practiced live firing, while the IL-28s were flown in visual meteorological conditions, once per month at the most, and used to put on a show of force at military parades. When the intensity of air force operations began*

Royal Afghan Air Force MiG-17s and IL-28s on the military side of Kabul airport in 1959.

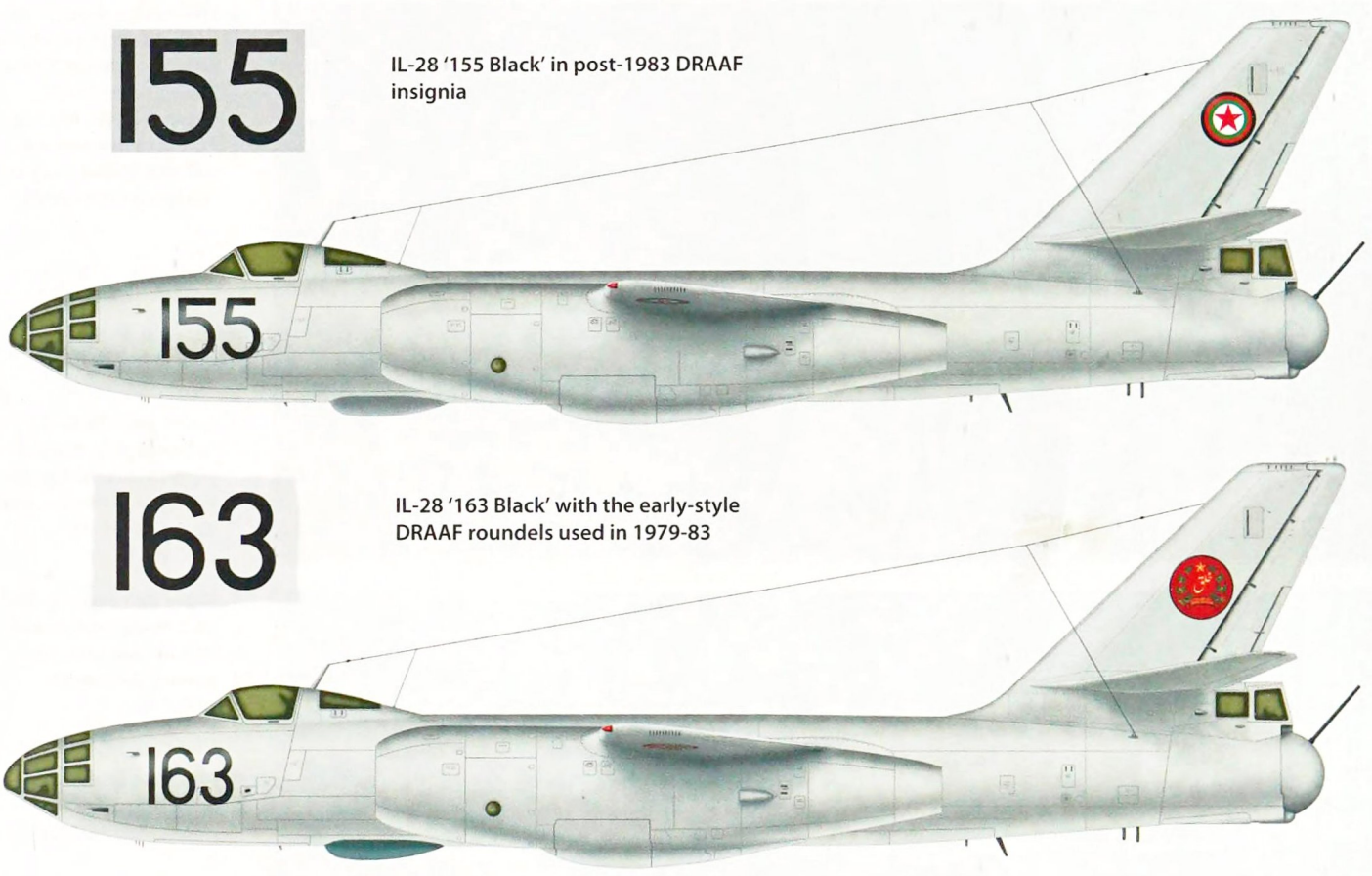
The stripped-out hulk of an IL-28 on the dump at Shindand in the 2000s. The remains of the original Royal Afghan Air Force insignia are still visible but the serial has become illegible.

Badly damaged IL-28U '003 Black' with faded DRAAF roundels sits among the rubble at Kabul.

Another shot of the dump at Shindand with several IL-28s, including '179 Green', lying in a heap.

increasing, the Afghan leaders requested that our factories build an additional batch of these aircraft and send more instructors for pilot training. However, it was quickly established that all the tooling had been long since thrown away and the MiG-17 was not even operated by the DOSAAF [paramilitary sports society] any longer, and the idea was dropped.'

There is some controversy surrounding the bomber squadron of the 335th Composite Air Regiment. There have been reports that all of its bombers (or even all of the regiment's aircraft) were destroyed on the ground by Mujahideen saboteurs at Shindand in January 1985. However, photos of the dump at Shindand AB (every airfield has its 'graveyard', you know) taken in the mid-2000s show at least a dozen IL-28s *sans suffixe* and one or two IL-28Us. To be sure, the aircraft were derelict by then, with many parts missing and canopies smashed, but they were definitely not burnt or blown up.



IL-28 '155 Black' in post-1983 DRAAF insignia

IL-28 '163 Black' with the early-style DRAAF roundels used in 1979-83

Afghan Air Force IL-28s retained their natural metal factory finish and originally sported the Royal Afghan Air Force's 1967-standard white roundels with an equilateral triangle divided into three equal parts – green (upper left), black (upper right) and red (lower) – and symbols that looked like the Arabic numerals '115' but were actually initials for 'Afghan Nero-e-Hawa'. In 1979 these were replaced by the early-style solid red DRAAF roundels, which in turn were changed to the late-style insignia (a red pentastar on a white roundel edged in green, red and black) in 1983. However, at least one of the *Beagles* dumped at Shindand appeared to wear the insignia of the **Northern Alliance** (also called Northern Coalition/United Islamic Front for the Salvation of Afghanistan, or NC/UF); this was a coalition of the warlords Ahmad Shah Massoud and Gen. Abdul Rashid Dostum against the notorious Taliban movement, an ultra-reactionary Islamic fundamentalist force which controlled most of Afghanistan in the 1990s. The NC/UF roundels were similar to the Royal Afghan Air Force roundels but lacked the red part; yet, this might simply have weathered away.

Albania

The **Albanian People's Republic Air Force** (*Forcat Ushtarake Ajore Shqipëtare*, later renamed *Aviacione*

Known Afghan Air Force IL-28s

Serial	Version	C/n	Notes
003 Black	IL-28U	?	Preserved Kabul City; damaged by Taliban shelling
150 Green?	IL-28	?	Derelict Shindand mid-2000s, serial not clearly visible
154 Green	IL-28	?	Derelict Shindand mid-2000s, late DRAAF markings with Royal Afghan Air Force markings visible underneath
155 Black	IL-28	?	Derelict Bagram
163 Black	IL-28	?	335th Composite Air Regiment, early-style (red) DRAAF roundels
168 Green	IL-28	?	Derelict Shindand mid-2000s, NC/UF markings?
175 Green	IL-28	?	Derelict Shindand mid-2000s, late DRAAF markings
179 Green	IL-28	?	Derelict Shindand mid-2000s, late DRAAF markings
1...2 Green	IL-28	?	Derelict Shindand mid-2000s, serial only partly legible

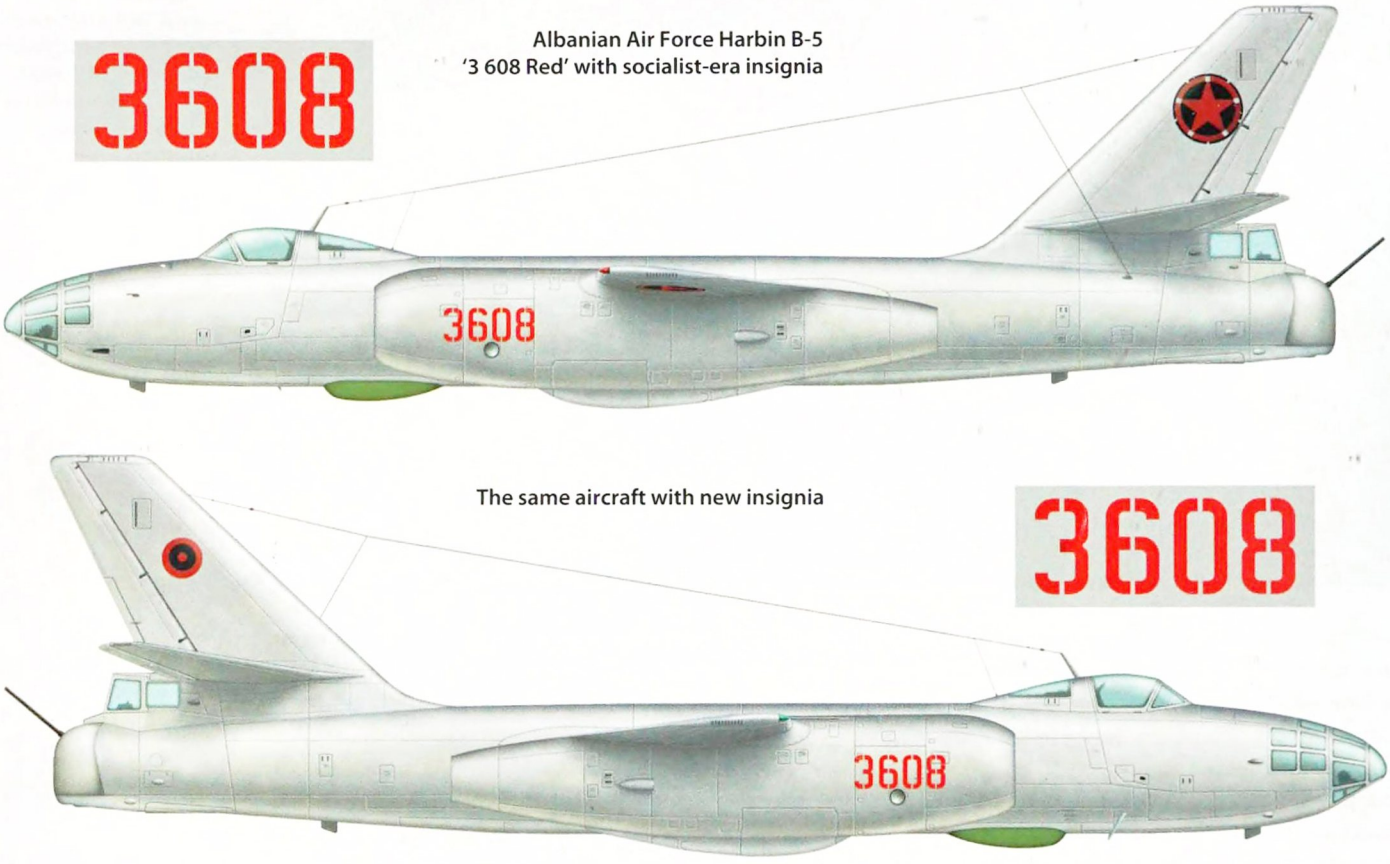
Albanian Air Force H-5 '3 608 Red' streams its twin brake parachutes on landing at Tirana-Rinas. The roundel on the tail has almost vanished.

Ushtarake Shqipëtare; in some sources the Albanian name has been rendered as *Aviatika Militar e Republika Popullóre e Shquipërise*) reportedly took delivery of only a single Soviet-built IL-28 before relations with the Soviet Union soured on ideological grounds and Albania went into self-imposed political isolation. This aircraft was reportedly used mostly as a target tug and eventually exchanged for a Chinese-built Harbin H-5, which was used in the same capacity. However, other reports say there was more than one *Beagle* – an unspecified number of Chinese-built Harbin H-5s were delivered. Three aircraft serialled 026 Red, 29 Red and 3608 Red have been identified to date; the latter example (actually the serial looked more like '3 608', with a space after the first digit) is an H-5 in natural metal with current-style Albanian Air Force roundels. It reportedly belonged to the 4020th (formerly 7594th) Aviation Regiment based at Rinas AB near the Albanian capital, Tirana, and remained operational until 1993; however, the 4020th AR is a fighter unit.

Algeria

The Soviet Union began providing military assistance to the Republic of Algeria in 1962, right after the latter had

The same aircraft in a hangar with the national insignia freshly reapplied.



Albanian Air Force Harbin B-5
'3 608 Red' with socialist-era insignia

The same aircraft with new insignia

gained independence from France. This included large-scale deliveries of aircraft to the **Algerian Air Force** (*Force Aérienne Algérienne*, or *al Quwwat al-Jawwiya al-Jaza'eriya*).

The IL-28 was the first Soviet bomber type supplied to Algeria. An initial batch of twelve IL-28s was delivered to the Algerian Air Force via Egypt, with which Algeria was closely allied, in 1964-65; direct deliveries might have caused unfavourable political consequences for the Soviet Union. These aircraft probably participated in the border conflict with Morocco in 1963. The relationship was somewhat soured when President Ahmed ben Bella was deposed on 19th June 1965 in a military coup and Houari Boumedienne, the new President, banned the Algerian Communist Party. However, relations were normalised in 1966, allowing a further 12 *Beagles* to be delivered directly from the USSR when the new government requested additional military aid.

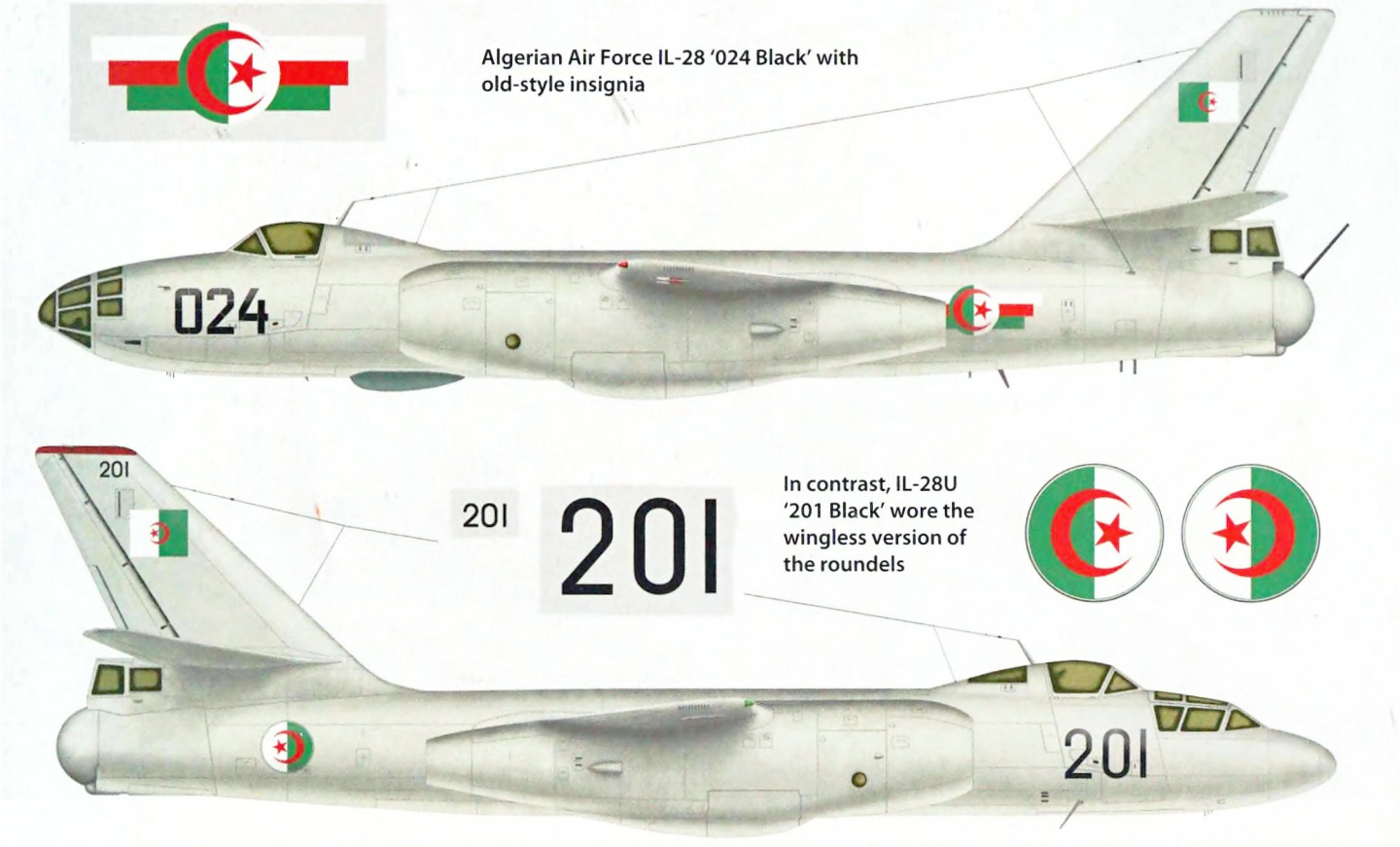
An Algerian Air Force IL-28 serialled 211 Black.

The bombers saw service with the 27e *Escadron* (squadron). 12 of them were among the shipment of Algerian aircraft donated to Egypt and sent to the war zone on 6th June 1967 to assist in the Six-Day War (which also included 20 MiG-17F and 20 MiG-21F-13 *Fishbed-C* fighters). Nearly all remaining *Beagles* were unserviceable by 1979, and the few operational examples were relegated to secondary duties.

Only four Algerian Air Force IL-28s have been identified so far. These are the bombers serialled 024 Black, 207 Black and 211 Black and an IL-28U serialled 201 Black.

Bulgaria

The **Bulgarian Air Force** (BVVS – *Bolgarski Voyenno Vozdooshni Seeli*) operated various versions of the *Beagle*. Around 36 IL-28s were based at Tolbukhin AB near the city of the same name in the north-east of the country (the city and the base have now regained their

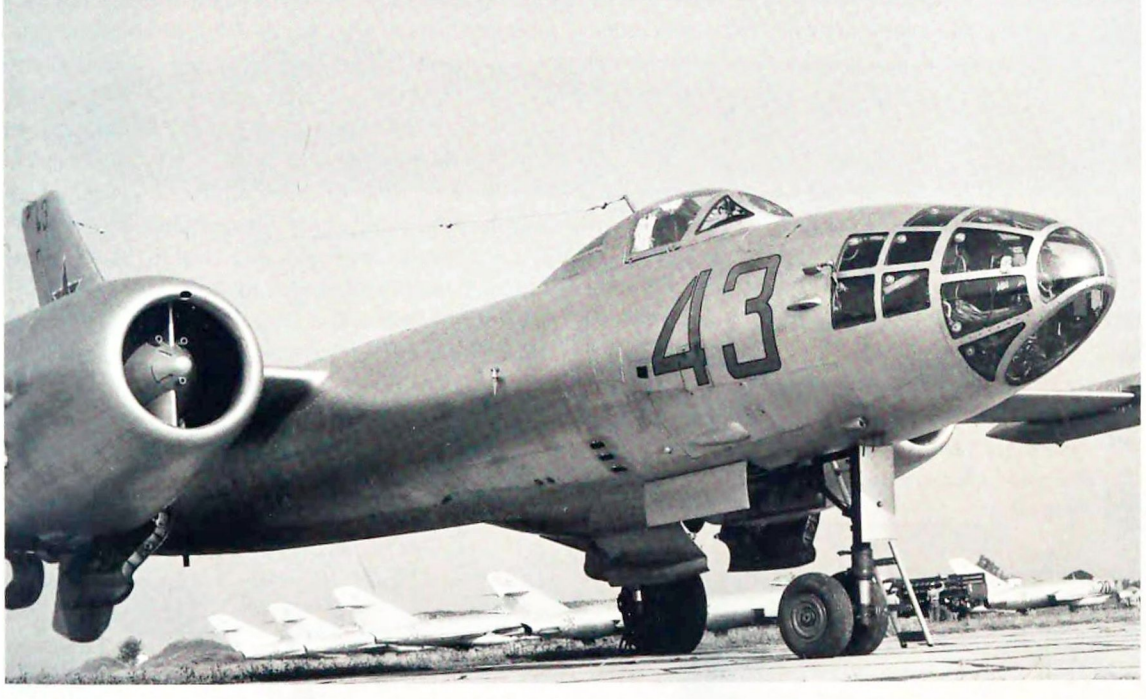


Algerian Air Force IL-28 '024 Black' with old-style insignia

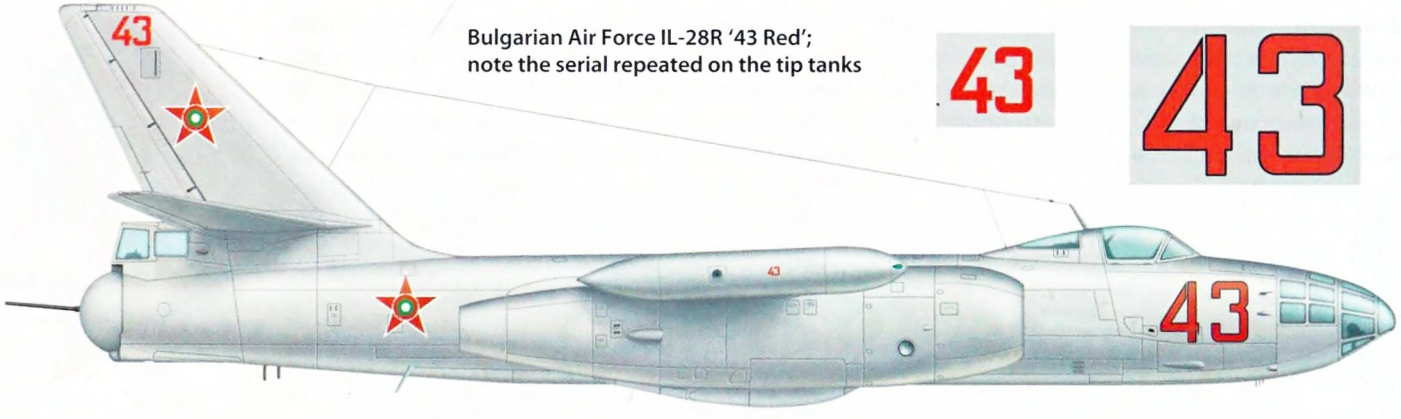
In contrast, IL-28U '201 Black' wore the wingless version of the roundels

original name, Dobrich); these included four IL-28R reconnaissance aircraft, a few IL-28T torpedo-bombers and two IL-28U trainers. A dozen aircraft modified for electronic warfare duties were reportedly still operational in 1983.

Only three aircraft have been identified so far. These are IL-28 '33 Red', IL-28R '43 Red' (this aircraft, erroneously reported as an Irkutsk-built IL-28 bomber with the c/n 52504, is on display at the Bulgarian Air Force Museum at Graf Ignatievo AB near Plovdiv) and an



Bulgarian Air Force IL-28R '43 Red' is seen here during its operational days, sharing the hardstand with MiG-17s fighters.



Bulgarian Air Force IL-28R '43 Red';
note the serial repeated on the tip tanks

Bulgarian Air Force IL-28 '33 Red'
with two mission markers

IL-28U (c/n 65010502). No tactical code has been reported for the latter aircraft; however, typically of BVVS combat aircraft of the time, it sported a triangle with an identification number arranged in two tiers – in this case, 4/7156.

Cambodia/Kampuchea

Cambodia, a former French protectorate, was granted independence in 1953 to become an independent constitutional monarchy under King Norodom Sihanouk, who had been enthroned in 1941. The **Royal Khmer Aviation** (RKhA) was created on 1st April 1954. In 1955 King Norodom Sihanouk abdicated in favour of his father Norodom Suramarit to become an elected Prime Minister, but became head of state again after his father's death in 1960, calling himself a Prince.

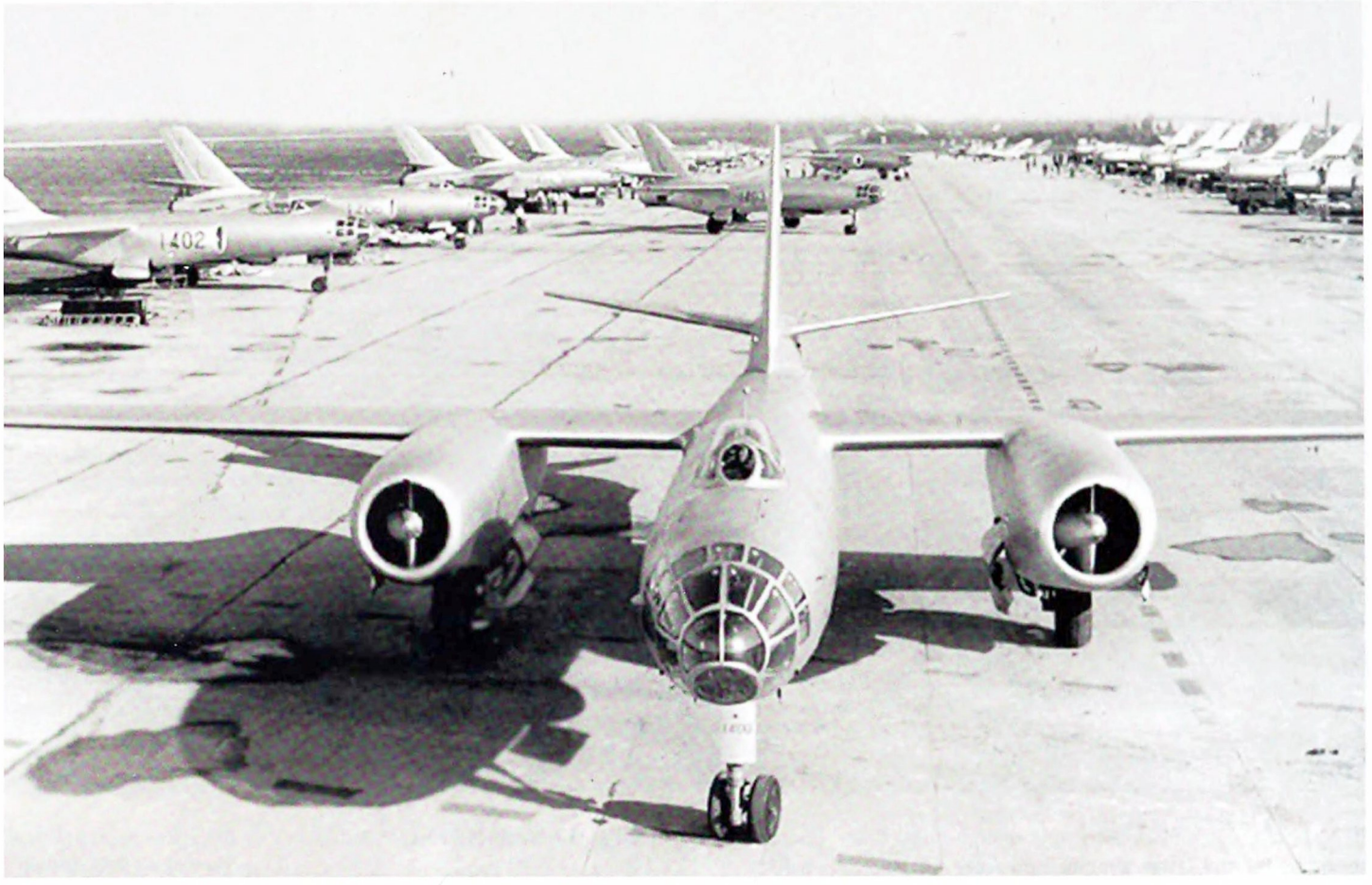
During the reign of Prince Norodom Sihanouk, who was considered to be sympathetic to the communist cause, Cambodia was on good terms with the Soviet Union and China, receiving weapons from both nations – mostly as a gift. Sihanouk allowed the South Vietnamese communists (Viet Cong) to use Cambodia as a sanctuary and a supply route for weapons and other materiel coming from North Vietnam. This, together with Sihanouk's ruling style, earned him many enemies. In March 1970 he was deposed in a pro-American military coup d'état led by the then Prime Minister Gen. Lon Nol. The country was renamed the Khmer Republic, and the RKhA was accordingly restyled as the **National Khmer Aviation** (NKA).

Lon Nol professed a neutral policy over the Vietnam War, although actually backing the USA, and demanded that the Viet Cong leave Cambodia. However, Sihanouk threw in his lot with the Khmer Rouge communist guerrillas led by Pol Pot, who supported North Vietnam, and a civil war ensued, followed by an American/South Vietnamese invasion to eliminate the Viet Cong in the Khmer Republic. In spite of American bombing of Khmer Rouge sites, the rebellion spread; the rebels seized the capital on 17th April 1975, changing the name of the country to Democratic Kampuchea. In fact, it was anything but democratic; Pol Pot installed a military dictatorship modelled on Mao Zedong's infamous 'Great Leap Forward' policy and started a systematic genocide of his own people.

It is not known whether any IL-28s had been supplied to the RKhA before the Khmer Rouge insurgency. However, it is known that a handful of *Beagles* were operated by the NKA when the country was run by Pol Pot. Considering the latter's close ties with China, these were probably Chinese-built Harbin H-5s transferred from People's Liberation Army Air Force stocks. None remained operational after Vietnam (which got fed up with the Kampuchean border raids) invaded Cambodia in November 1978, occupying the entire country and overthrowing the Pol Pot regime in January 1979.

Opposite page: Another view of '43 Red'; the tip tanks clearly identify it as an IL-28R – not a bomber as sometimes reported.

Above: Make hay while the sun shines! Bulgarian ground crew clear away the cut grass beside the taxiways while IL-28 '33 Red' is being refuelled in the background.


1402

Opposite page: Two views of IL-28s from a PLAAF unit (including '1400 Red', '1402 Red' and '1206 Red') taxying out for a take-off in squadron or regiment strength. Note the position of the serials on the engine nacelles and the curious organisation of the flight line (two facing rows of aircraft).

Left: A formation of Chinese IL-28s en route to the target.

China (PRC)

At the end of the Second World War in 1945 a civil war began in China between the Communists (led by Mao Zedong) and the Kuomintang Nationalist movement (led by Chiang Kai-shek) to determine who would run the country after the Japanese were defeated. In 1949 the Communists prevailed, creating the People's Republic of China (PRC, aka mainland China or Communist China); the Nationalists left the mainland and settled on Taiwan, declaring the Republic of China (RoC). On 11th November 1949 the **People's Liberation Army Air Force** (PLAAF, or *Chung-kuo Shen Min Taie-Fang-Tsun Pu-tai*; now rendered as *Zhòngguó Rénmín Jiěfàngjùn Kòngjùn*) was created; from 1950 onwards it became a major recipient of Soviet military aircraft and their locally produced clones.

The PRC was by far the largest foreign operator of the IL-28. Deliveries to the PLAAF started in 1952. The

Groups of PLAAF IL-28s fly in V formation over the Chinese countryside.

Opposite page, top: The flight line of a PLAAF unit operating H-5s; the serials were painted on the tails at the time. Note the ground crews lined up (almost ceremonially) beside each aircraft and the pilots sitting astride the cockpit sill.

Left: A scene that was not uncommon in those days – a theatrical and musical troupe performs directly on the flight line for the benefit of PLAAF H-5 crews to boost their morale.

first two PLAAF divisions to operate the type were the 5th Bomber Division (Jinan Military Region) and the 28th Bomber Division headquartered at Hangzhou (Nanjing MR).

Shortly afterwards, in the 1950s, the **People's Liberation Army Naval Air Force** (PLANAF, or *Zhòngguó Rénmín Jiěfàngjùn Hàijùn Hángkòngbìng*) also introduced the *Beagle*, starting off with a small number of IL-28T torpedo-bombers transferred from the Soviet Navy (together with a stock of RAT-52 torpedoes) and IL-28Us as the AVMF's minelayer and torpedo-bomber units disbanded.

Opposite page, bottom: Night operations in a PLANAF unit. The H-5 nearest to camera (83327 Red) has underwing pylons, making it either an HZ-5 reconnaissance aircraft or a target tug.

Leather-jacketed PLANAF airmen wearing 'bone dome' helmets march down the flight line past a row of HJ-5 trainers, including '83329 Red'. Though this is clearly a propaganda shot, the attire of some crewmen is definitely non-regulation.

Opposite page: The PLAAF used unusual simulation techniques. Here, pilots pace the flight line holding dummy H-5 windshields, and the ones on the sides are probably making engine noises! Note the low-viz insignia on the combat H-5s; the HJ-5 trainers lacking tail turrets wear the full-colour version.

Left and above left: H-5s cruise at high altitude in flights of three during an exercise.

A trio of PLAAF H-5s drop sticks of 100-kg bombs over the target range. Note the blue-painted radomes.

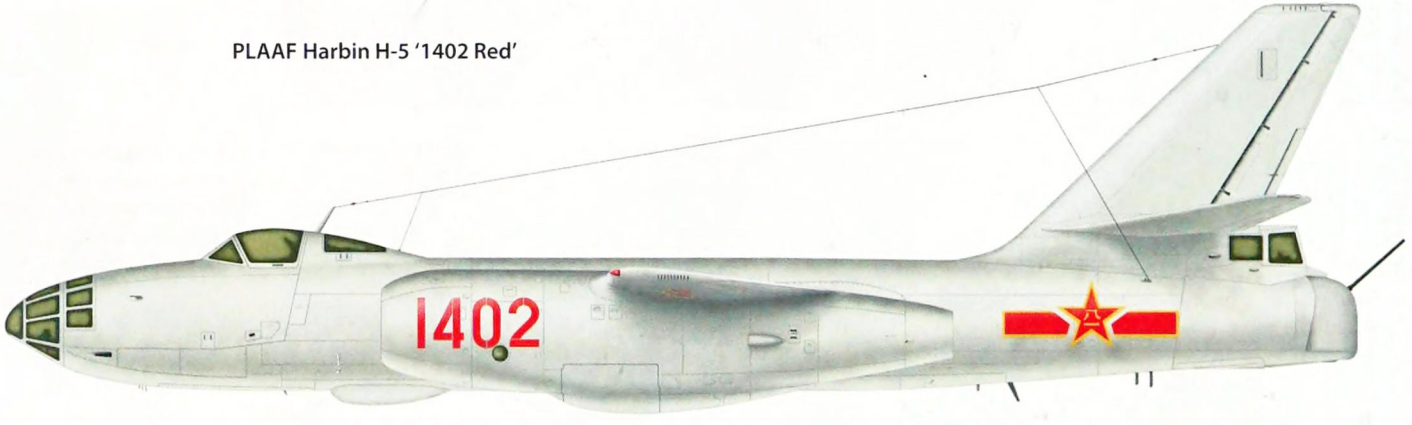
Opposite page, bottom: Two HD-5 ECM aircraft, including '21113 Yellow', share a hardstand with a pair of Shaanxi Y-8C transports.

H-5s and HJ-5s of the PLAAF's 1st Flying Academy on the flight line at Harbin-Lalin AB.

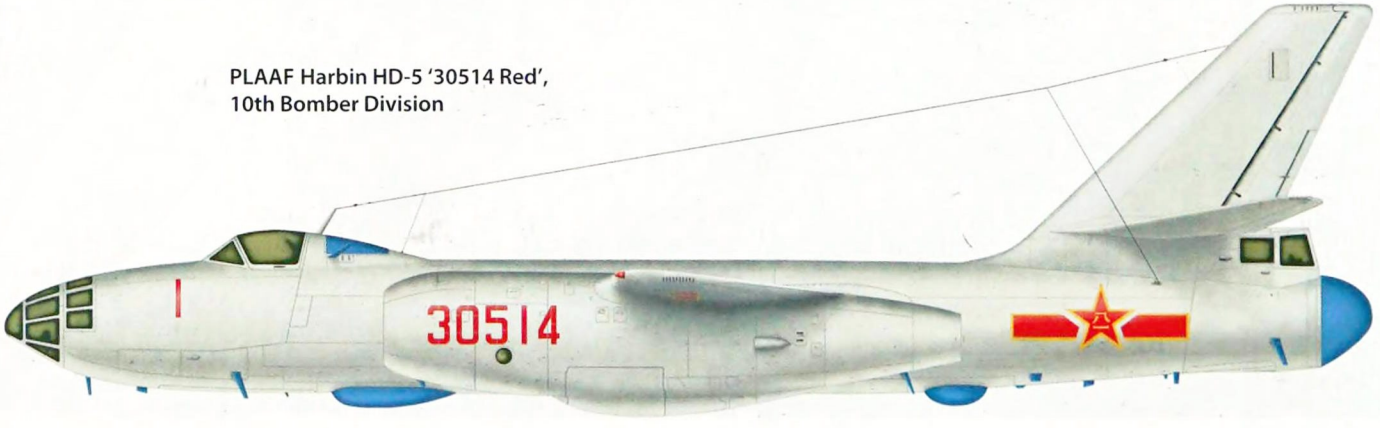
By 1956 the PLAAF and PLANAF inventory included more than 250 Soviet-built IL-28s; this figure presumably includes the trainers. More than 300 IL-28s were in service with 12 tactical bomber regiments by the end of 1964, not counting the trainers (a total figure of 400-plus has been reported in service).

The IL-28 became China's first modern bomber and a valuable asset, but no manufacturing licence for the type was obtained before the breakdown in Sino-Soviet relations. Hence, as already mentioned, China built the *Beagle* and *Mascot* without the benefit of a licence as the H-5 and HJ-5 respectively. Deliveries of the bomber

PLAAF Harbin H-5 '1402 Red'



PLAAF Harbin HD-5 '30514 Red', 10th Bomber Division



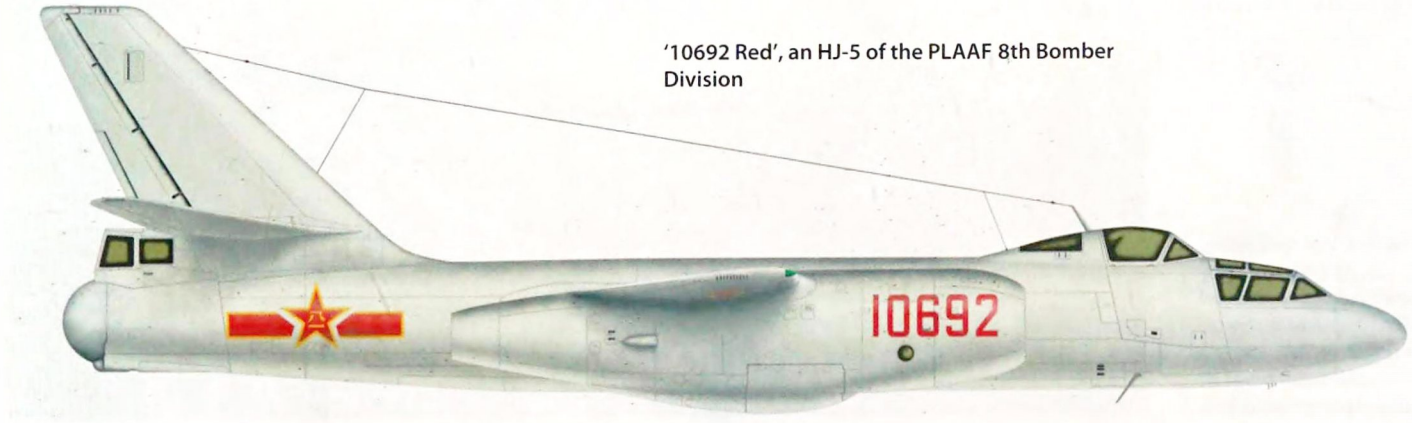
A guard keeps watch over an HD-5. Note the modified nose glazing.

PLAAF officers check with the blue-coated technicians to make sure this H-5 is fully serviceable.

version commenced in 1967; the HJ-5 was officially phased in by the PLAAF in 1972.

In addition to the baseline bomber and the trainer, the Chinese built and operated other versions, including a nuclear-capable bomber (sometimes called H-5A) and the HZ-5 photo reconnaissance version; development was rather protracted and the HZ-5 was not officially included into the PLAAF inventory until 1977. In the 1980s a small number of H-5s was converted to HD-5 ECM aircraft, remaining in service at least until 1997 when they were replaced by an ECM version of the Shaanxi Y-8. A target tug version with underwing hardpoints was also operated.

Furthermore, a torpedo-bomber version equivalent to the IL-28T (for which no separate designation is known) was developed for the PLANAF; it carried two

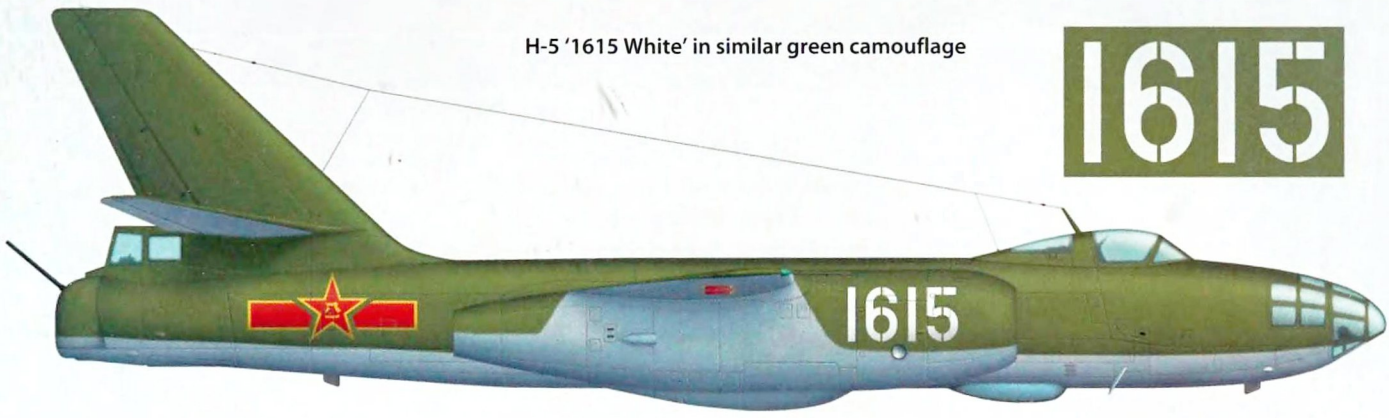


'10692 Red', an HJ-5 of the PLAAF 8th Bomber Division

PLAAF IL-28 '0195 Yellow', 8th Bomber Division, Jianqiao AB, 1966; the yellow lines may be formation-keeping markings

Airmen from the PLANAF Air Academy walk down the flight line at Xincheng AB past H-5 '83101 Red'. Oddly, only half the men are wearing life vests.

The one that got away. IL-28 '0195 Yellow' serialled under the old four-digit system was flown to Taiwan by a defector on 11th November 1966.



H-5 '1615 White' in similar green camouflage

IL-28s (or H-5s) pass in flights of three over a flight line chock full of sister ships during a military parade or a rehearsal for a parade.

Known PLAAF and PLANAF IL-28s/H-5s

Version	Serial	C/n	Notes
IL-28	0031 Red	?	
IL-28	0131 Red	?	
IL-28	0193 Yellow?	?	8th Division, Jianquao AB, Hangzhou? Green with blue undersurfaces; unconfirmed (drawing only)
IL-28	0194 Red	?	8th Division? Natural metal; unconfirmed (drawing only)
IL-28	0195 Yellow	?	8th Division; green with blue undersurfaces. Flown to Taiwan by defector 11-11-1966; preserved ROCAF Museum, Taoyuan AB
IL-28	0851	4149	Possibly Voronezh-built (full c/n 4404149)! GIA Beijing Institute. Became, see next line
	no serial		Natural metal. Preserved PLAAF Museum, Datangshan AB
IL-28	1110 Yellow	?	Green with blue undersurfaces
IL-28	1206 Red	?	Natural metal
IL-28	1210 Yellow	?	Green with blue undersurfaces
IL-28	1400 Red	?	Natural metal
IL-28	1402 Red	?	Natural metal; unconfirmed (drawing only)
IL-28	1403 Red	?	Natural metal
IL-28	1471 Red	?	Green with blue undersurfaces
IL-28	1510 Red	?	Green with blue undersurfaces
IL-28	1512 Red	?	Natural metal
IL-28	1513 Red	?	Natural metal
IL-28 (H-5?)	1615 White	?	Green with blue undersurfaces; unconfirmed (drawing only, depicted as an H-5)
IL-28	1618 White	?	Green with blue undersurfaces; unconfirmed (drawing only)
IL-28	1718 Red	?	Natural metal
IL-28	1810 Red	?	Natural metal
IL-28	8801	?	Preserved Taiyuan
IL-28	8812	?	Preserved Yangshan
IL-28	9959	?	Preserved Chengdu
IL-28	00506	?	Preserved Lushan
IL-28	02202	?	Preserved Fengtai
IL-28	10198 Red	?	8th Bomber Division. Natural metal. Preserved PLAAF Museum
IL-28	10290	55006571	8th Bomber Division. Ex-PLANAF 82025. Natural metal. Preserved PLAAF Museum
IL-28	10297	?	8th Bomber Division. Preserved Tengzhou
IL-28	11264	54120	5th Bomber Division. Full c/n 53004120. 5th Division, natural metal finish. Sometimes reported in error as an H-5. Natural metal. Preserved PLAAF Museum; no serial by 10-1993
IL-28	20166	?	25th Bomber Division. GIA Nanking Aviation College
IL-28 (H-5?)	30514 Red	?	10th Bomber Division. Natural metal
IL-28 (H-5?)	30518	?	10th Bomber Division

Yu-2 torpedoes which were Chinese clones of the RAT-52. More than 100 naval IL-28s were converted in this fashion. They were to play a key role in warding off a hypothetical Taiwanese maritime landing assault; this was a time when the Beijing government considered an invasion from Taiwan a distinct possibility.

This H-5 wears an unusual two-tone blue camouflage scheme with white undersides.

In the 1980s the H-5 served with the PLAAF's 8th Bomber Division (HQ Datong, Beijing MR), the 10th Bomber Division (HD-5s only, HQ Anqing, Nanjing MR), the 20th Bomber Division (HQ Gongzhuling, Shenyang MR), the 23rd Bomber Division, the 25th Bomber Division (HQ Lintong, Lanzhou MR) and the 48th Bomber Division (HQ Laiyang, Wuhan MR). The type also served with two PLAAF Flying Academies – No.1 in Harbin (3rd Regiment at Lalin AB, Shenyang MR) and No.2 in Chengdu (2nd Regiment at Huxian AB and 3rd Regiment at Pengshan AB, Chengdu MR). PLANAF IL-28s/H-5s served with a bomber division at Tuchengzi AB (Shenyang MR) and the Naval Air Academy at Xingcheng AB (Jinan MR), among other things.

Several H-5s found use as avionics, weapons, ejection seat and engine testbeds at the **China Flight**

IL-28 (H-5?)	30710	?	10th Bomber Division
IL-28 (H-5?)	30711	?	10th Bomber Division
IL-28 (H-5?)	30712	?	10th Bomber Division
IL-28 (H-5?)	30713	?	10th Bomber Division
IL-28 (H-5?)	30714	?	10th Bomber Division
IL-28 (H-5?)	30717	?	10th Bomber Division
IL-28 (H-5?)	30718	?	10th Bomber Division
IL-28 (H-5?)	30810	?	10th Bomber Division
IL-28 (H-5?)	30811	?	10th Bomber Division
IL-28 (H-5?)	30812	?	10th Bomber Division
IL-28 (H-5?)	30814	?	10th Bomber Division
IL-28 (H-5?)	30815	?	10th Bomber Division
IL-28	45552 Red	?	Natural metal; serial may be fake as suggests 44th Division
IL-28 (H-5?)	63108	?	GIA Beijing Institute
IL-28 (H-5?)	70722	?	GIA Guangzhou-Baiyuan, fake serial?
IL-28 (H-5?)	72097	?	Navigator Training School. Preserved Xian-Yanliang
IL-28T?	80002	53005574	PLANAF. Preserved PLANAF Museum, Qingdao AB
IL-28T?	81018	?	PLANAF. Preserved Jinzhou until 4-2009, moved to Tangwan by 8-2009
IL-28T?	81038	?	PLANAF. Crashed 24-8-1985
IL-28T?	82025	55006571	Reported in error as a Harbin HZ-5. PLANAF/1st Navy Division. To the Air Force as 10290
IL-28 (H-5?)	83101	?	Naval Air Academy
IL-28	84103	53004335	Naval Air Academy
IL-28 (H-5?)	98723	?	Preserved Nanjing
IL-28 (H-5?)	070316	?	Preserved Nanchang, fake serial
IL-28	?	55006661	
IL-28U	61 Red?	?	Also rendered as 61 Black; natural metal
IL-28U	10692 Red	67211	8th Bomber Division. Natural metal. Preserved PLAAF Museum; c/n often reported in error as 87211 (full c/n 64007211)
Harbin H-5	038 (?)	H5-*****	Flown to South Korea by defector 24-8-1985, preserved Seongmu
Harbin H-5	080	H5-*****	Preserved Xian-Yanliang, CFTE testbed?
Harbin H-5	3217	H5-*****	Crashed 8-1989
Harbin H-5	10198 Red	H5-01305	Preserved PLAAF Museum
Harbin H-5	43684 Red	H5-*****	Natural metal
Harbin H-5	45693 Red	H5-*****	Natural metal; reported in error as IL-28U
Harbin H-5	83002 Red	H5-*****	Natural metal; target tug with wing pylons
Harbin H-5	70190	H5-02038	Preserved Guangzhou-Pudong
Harbin HZ-5	44690 Red	H5-02608	Preserved PLAAF Museum, two-tone blue camouflage with white undersurfaces; non-standard nose
Harbin HD-5	21112 Yellow	H5-02706	Preserved PLAAF Museum
Harbin HD-5	21113 Yellow	H5-*****	
Harbin HJ-5	63019 Red	?	1st Flight Academy
Harbin HJ-5	63810 Red	?	1st Flight Academy
Harbin HJ-5	63913 Red	?	Preserved Harbin
Harbin HJ-5	71422	?	Wfu Pengshan
Harbin H-5	83130 Red	H5-*****	H-5 Ying avionics/weapons testbed

Test Establishment (CFTE) at Xian-Yanliang AB. In particular, one might mention the H-5 Ying integrated avionics/weapons testbed.

China (RoC/Taiwan)

The Republic of China Air Force (ROCAF) operated a single ex-PLANAF IL-28 which, as recounted earlier, fell into Nationalist hands when its crew defected on 11th November 1966. After being returned to airworthy condition the aircraft was reportedly used for spy missions over mainland China, retaining its PLAAF 'stars-and-bars' insignia and the serial '0195 Yellow'. It is now on display at the ROCAF museum at Taoyuan AB near Taipei.

Cuba

Soviet-Cuban co-operation in defence matters began shortly after the victory of the 1959 Cuban Revolution led by Fidel Castro Ruz and Ernesto 'Che' Guevara. On 4th March 1960 the French freighter M/V *La Coubre*, which had brought a cargo of Belgian ammunition for the Cuban Revolutionary Armed Forces, was blown up in Havana Harbour in what was perceived as an act of sabotage masterminded by the CIA. After this incident,

purchases of western armaments became impossible, forcing the Cubans to look for other suppliers – and they quickly found one. On 29th March 1960 the Soviet government declared that it was ready to extend military assistance to Cuba in an emergency (read: counter-revolutionary invasion). In July 1960 the Cuban Minister of Defence Raúl Castro Ruz visited Moscow, signing a communiqué which outlined a long-term Soviet military commitment towards Cuba.

Originally the Soviet military aid to Cuba was on a small scale, but it was stepped up considerably after the failed CIA-backed landing operation at Playa Girón (aka the Bay of Pigs Invasion) in April 1961. On 4th August 1961 the Soviet Union and Cuba signed an arms deal worth US$ 48.5 million; of this amount Cuba was to pay only US$ 6 million. A second US$ 149.55 million arms package was contracted on 30th September, the Cubans being obliged to pay only US$ 67.55 million.

Moreover, on 12th April 1962 the Soviet government agreed to extend additional military assistance to Cuba, which was under threat of a US military invasion. This third package included the delivery of ten IL-28 bombers to the Cuban Air Force (FAR – Fuerza Aérea Revolucionaria). However, even that would not be enough to ward off an invasion; as mentioned in Chapter 6, this eventually led the Soviet Union to deploy its own troops on Cuba, thereby provoking the Cuban Missile Crisis.

No Cuban IL-28s have been identified so far.

Czechoslovakia

The **Czechoslovak Air Force** (CzAF, or ČVL – *Československé Vojenské Letectvo*) began its involvement with the IL-28 in 1952, when the issue arose of finding a replacement for the obsolete Pe-2 dive bomber (known in CzAF service as the B-32, the B standing for *bombardovací* [*letoun*] or *bombardér* – bomber). A CzAF Command report issued on 26th November 1952 and titled 'The Prospects of the Czechoslovak Air Force's Armament' envisaged a twin-turbojet bomber of Soviet origin, specifically mentioning 'probably the IL-28'. Well, apart from the Tu-14, what other options could there be at the time? The same was mentioned in the 'CzAF Re-equipment Plan up to 1960', which was drawn up in 1953; it envisaged that deliveries would start in early 1954 and the bomber units would re-equip completely by 1957. The decision to order the *Beagle* was formalised in December 1953.

The formation earmarked for equipment with the IL-28 was the 46. LD (*letecká divize* – 46th Air Division) established in 1951 and headquartered at Hradčany (Mimoň AB), where a new concrete runway was built. The division was directly subordinated to the CzAF Command, comprising the 24. LP (*letecký pluk* – 24th Air Regiment), the 25. LP (the former 47. LP which moved in from Brno) and the 29. LP; the two new regiments were established on 1st September 1951. Each regiment initially consisted of two squadrons and a command flight; a third squadron was later added, bringing the division up to nine-squadron strength.

Even then it was clear that deliveries of the new jet hardware would take time, so initially the 46. LD was to be equipped with Tu-2s and UTB-2s to be delivered by the end of the year. Eventually, however, this was deemed inexpedient and the 46. LD had to make do with equally obsolete piston-engined Aero C-3A utility transports and C-3B bomber trainers (the Czech-built versions of the Siebel Si 204D, a number of which had been captured from the Luftwaffe at the end of the war). The C-3 was adequate for training purposes but absolutely no good as a combat aircraft.

In 1952 the names of the units were amended to reflect their role – specifically, *letecká bombardovací divize* (bomber division) and *letecký bombardovací pluk* (bomber regiment). Still, the old names continued in use in official documents as late as 1953. In 1954 the word order was changed for some reason, the division becoming the 46. BoLD (*bombardovací letecká divize* – 46th Bomber Division) and its constituent 24. BoLP (*bombardovací letecký pluk* – 24th Bomber Regiment), 25. BoLP and 29. BoLP.

In October 1954 the 25. BoLP moved to a new base at Přerov. In January 1955 it took delivery of the first three IL-28s – two bombers and one trainer. Five Soviet instructors started training the first ten crews at Přerov on 9th February; Sqn 1 was the first to begin theoretical training. A few problems arose at this stage because of the language barrier: the instructors lectured in Russian (or course), and the trainees' knowledge of the language was insufficient for keeping up with them, even though Russian-language training was obligatory in the Czechoslovak Armed Forces. Still, the trainees were quick on the uptake – specialists from the CzAF's Aviation Technical School in Liptovský Mikuláš, northern Slovakia, who spoke better Russian, studied the aircraft while listening to the instructors and then coached their less proficient 'classmates'. Flying training commenced on 17th February and the first group completed its training course in four weeks. This allowed the first three aircraft flown by CzAF crews to participate in the VE-Day air parade at the Letná Plain in Prague on 9th May 1955; the lead aircraft in the flight was piloted by Maj. Josef Končír, the 46th Division's CO.

Until 1956 the Czechs had a habit of redesignating aircraft of foreign origin in CzAF service. The B-32 and C-3 have been mentioned; similarly, the Messerschmitt Bf 109G became the S-99 (*stíhací* [*letoun*] – fighter), the two-seat Bf 109G-12 was the CS-99 (*cvičný stíhací* – fighter trainer), the MiG-15 *Fagot-A* and MiG-15*bis* *Fagot-B* were built locally under Soviet licence as the Aero S-102 and S-103 respectively (and the UTI-MiG-15

Midget as the Aero CS-102) etc. In keeping with this practice the IL-28 bomber and IL-28U trainer were redesignated B-228 and CB-228 respectively (*cvičný bombardér* – bomber trainer). However, this practice was discontinued on 29th September 1956 by official order, the CzAF reverting to the Soviet designations.

Here, a persistent myth must be laid to rest. The designations B-228 and CB-228, together with the abbreviated five- or six-digit c/ns of exported IL-28s, led many researchers to believe that the type was built in Czechoslovakia under licence (some claim that more than 200 were built), and Avia was assumed to be the manufacturer. In reality it was not. Recent reports by Czech researchers on the subject show that plans for further re-equipment of CzAF bomber units were abandoned, among other things, because IL-28 production in the Soviet Union had ended, making further deliveries impossible. Now would that have

Above: A CzAF ramp controller with flags watches as IL-28 AD-34, a 25. BoLP aircraft, taxies out at Přerov.

Below: The same scene a few minutes later. IL-28 AD-31 shows signs of firing the nose cannons.

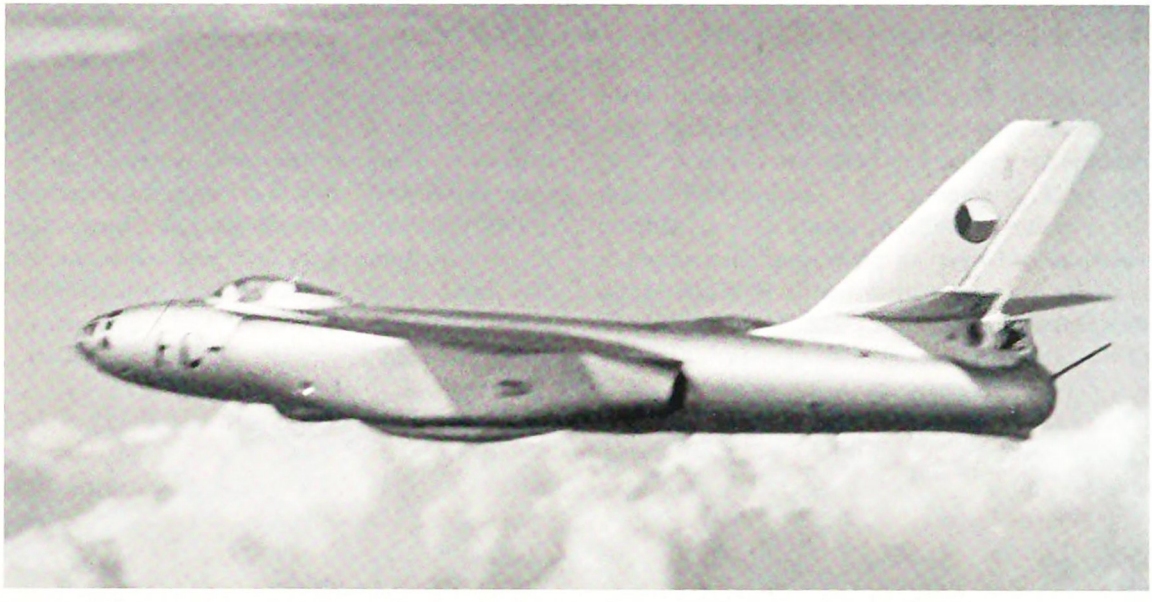
been a hindrance if the B-228/CB-228 had been produced locally?

Later, the bomber version was sometimes referred to as the IL-28B by the Czechs, though not in official papers. This is partly true – the final bombers for the CzAF were Irkutsk-built (and, as mentioned earlier, such aircraft were indeed unofficially designated IL-28B).

On 4th September 1955 ten IL-28s escorted by S-102 fighters took part in the Air Force Day flypast at Prague-Ruzyne airport in front of the Czech government, staging a mock attack on an 'enemy airfield'. However, the performance was almost overshadowed by a formation of 33 C-3s shaped like a hammer and sickle. The organisers of the flypast had probably wanted to show that well-used aircraft were giving way to new types, but the implication was just the opposite – 'the old guard never surrenders, it only dies'!

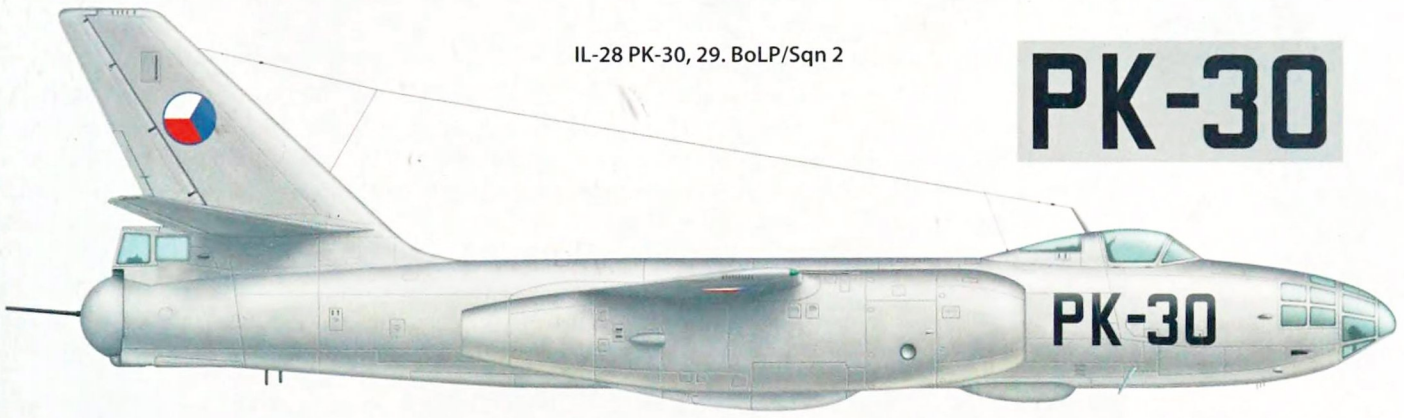
The IL-28s became fully operational with the CzAF by October 1955 when the first live bombing practice sessions at target ranges were performed. That month the 46. BoLD left Hradčany for good – the division HQ and the 24. BoLP joined the 25. BoLP at Přerov, while the 29. BoLP moved to Mladá AB in Milovice near Prague. At the end of the year the Air Force had 20 *Beagles* and three *Mascots* on strength, and counting. The 46. BoLD re-equipped completely by July 1956; a further 36 bombers were delivered that year, along with three IL-28Us and ten IL-28Rs (of which more will be said later). Each regiment was to have 35 aircraft – 32 bombers (two in the command flight and ten per squadron) and three trainers (one per squadron); the first flight in each squadron consisted of four bombers, the other two had three aircraft each. However, the 29. BoLP never reached full strength, operating only 14 IL-28s *sans suffixe* and two IL-28Us.

Speaking of bombing practice, this was performed at the Libavá, Malacký and Nová Ves target ranges, among other things. The most commonly used type of



An air-to-air of an IL-28 (B-228) from the 25. BoLP command flight.

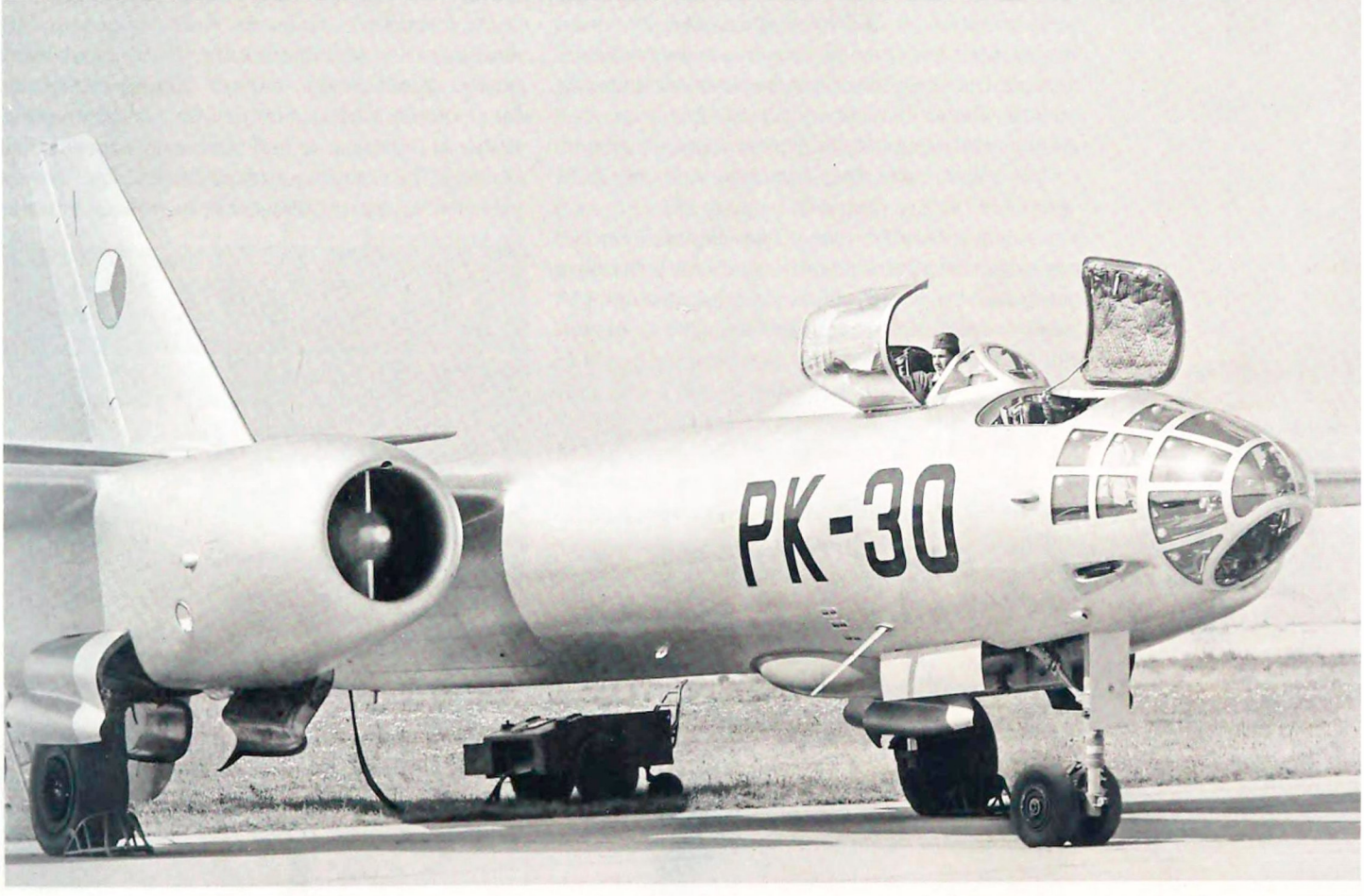
IL-28U (CB-228) CD-10 of the 24. BoLP/Sqn 1 is caught by the camera a second before touchdown.



bomb was the locally designed CCP-50-75 (*cvičná cementová puma* – 'practice cement bomb') having a cast-iron nosecone and a cylindrical concrete body. Even though Czechoslovakia had no nuclear weapons, the locally developed ZVAP-250-110 practice bomb emulating the flash and mushroom cloud of a nuclear blast (ZVAP = *značkovač výbuchu atomové pumy* – nuclear bomb explosion emulator) was occasionally used. One such case – presumably a test drop – was carried out at the Libavá range on 10th July 1958; two bombs were dropped from 4,150 and 4,250 m (13,620 and 13,940 ft). Other known cases were on 20th March 1959 at Trenčín AB during an exercise and on 28th June 1959. In the latter case the bomb was released in a climbing turn initiated at 600 m (1,970 ft) to see if the bomber could deliver a nuke in low-level flight and get away; Jaroslav Dvořák, who was the pilot in all three cases, recounted later that in a real-life nuclear scenario using the toss bombing technique would have been impossible.

Occasionally there were spills. For example, on 3rd August 1957 a flight of three IL-28s heading for the

A pristine IL-28 (B-228) in pre-1957 markings with a locally built battery cart connected. The alphanumeric serials on the nose later gave way to four-digit serials on the rear fuselage.



Another CzAF IL-28 in pre-1956 markings has just returned from a sortie.

Malacký range dumped their bomb load – three live OFAB-100 HE/fragmentation bombs each – 5.2 km (3.23 miles) short of the target because of a navigational error. The bombs fell near Juriky hamlet, the nearest ones exploding just 15 m (50 ft) away, causing some collateral damage but fortunately no civilian casualties. A similar incident occurred during a night bombing sortie on 16th April 1959 when a 25, BoLP IL-28 missed the Nová Ves target range – again with only collateral damage. One more episode at the Nová Ves range was on 24th August 1959 when CCP-50-75 inert practice bombs were accidentally dropped on Kozlov township.

For pilots converting from the C-3, the IL-28 harboured a few surprises – both pleasant and unpleasant ones. The former kind included a more agreeable take-off technique – to rotate you pulled back gently on the control column instead of pushing it forward vigorously, as on the 'taildragger' C-3. At high altitude the controls became lighter and the fuel burn per hour decreased dramatically. On the minus side, there was a need to watch the CG position throughout the flight and make corrections by transferring fuel to the rear group of tanks, otherwise an excessively forward CG could result in dangerous handling on landing. The autopilot needed to be painstakingly tuned before the pilot could let the navigator take over and do his job.

The IL-28 had neither airbrakes nor thrust reversers, and the wheel brakes needed to be used on landing – which the pilots converting from the C-3 with its low landing speed were unaccustomed to. To assist them in mastering the braking technique, a special taxi trainer – a tricycle buggy powered by two Walter Minor six-cylinder in-line air-cooled engines with propellers – was built. A nasty surprise for the tech staff was that the IL-28 was too tall to go through the doors of existing hangars. The technicians found an ingenious solution – a special dolly was built to raise the nosewheels off the ground, tilting the aircraft so that the tail could clear the hangar doors! Apparently this was easier than modifying the hangars! (Incidentally, Convair had to use the same technique with every single B-36 Peacemaker when the bombers were rolled out at the Dallas-Fort Worth plant.)

As mentioned above, the IL-28R reconnaissance version – or B-228R, as it was known locally for a while – entered CzAF service on 1st January 1956; the designation B-228R was rather odd, considering that neither of the Czech terms for reconnaissance begins with an R. The aircraft were Irkutsk-built. Originally they were divided equally between the 24. BoLP and the

The pre-1957 serial prefix codes allocated to the 46. BoLD (on 31st July 1952) and the direct reporting 47. PzLP

Letter code	Regiment/squadron
AC	24. BoLP/Sqn 3
AD	25. BoLP/Sqn 2
BA	25. BoLP/Sqn 1
BC	24. BoLP/command flight
CD	24. BoLP/Sqn 1
DE	25. BoLP/Sqn 3
EB	24. BoLP/Sqn 2
FC	25. BoLP/command flight
FH	29. BoLP/command flight
GO	?
LB	46. BoLD/command flight
LZ	47.PzLP/Sqn 2
OV	47.PzLP/command flight
PK	29. BoLP/Sqn 2
PU	47.PzLP/Sqn 1
RL	29. BoLP/Sqn 3
TH	29. BoLP/Sqn 1

25. BoLP, but after 14th May 1956 they were transferred to the 47. PzLP (*průzkumný letecký pluk* – Reconnaissance Air Regiment) at Mladá, which was then operating the MiG-15*bis*R PHOTINT version of the *Fagot-B* (or rather S-103). (By curious coincidence, a Soviet Air Force unit with the same number – the 47th GvORAP – was likewise a reconnaissance regiment and likewise equipped with IL-28Rs.)

As often as not, the CzAF's IL-28Rs were flown without the usual wingtip tanks. The 47. PzLP also had a single IL-28U for proficiency training.

Under the serial system in use since January 1946 CzAF aircraft had alpha-numeric serials consisting of one or two letters and two digits separated by a dash. The letters were a code denoting the squadron; to complicate identification for the outsider the squadron codes in a given regiment were assigned randomly (i.e., non-sequential; see table on the opposite page).

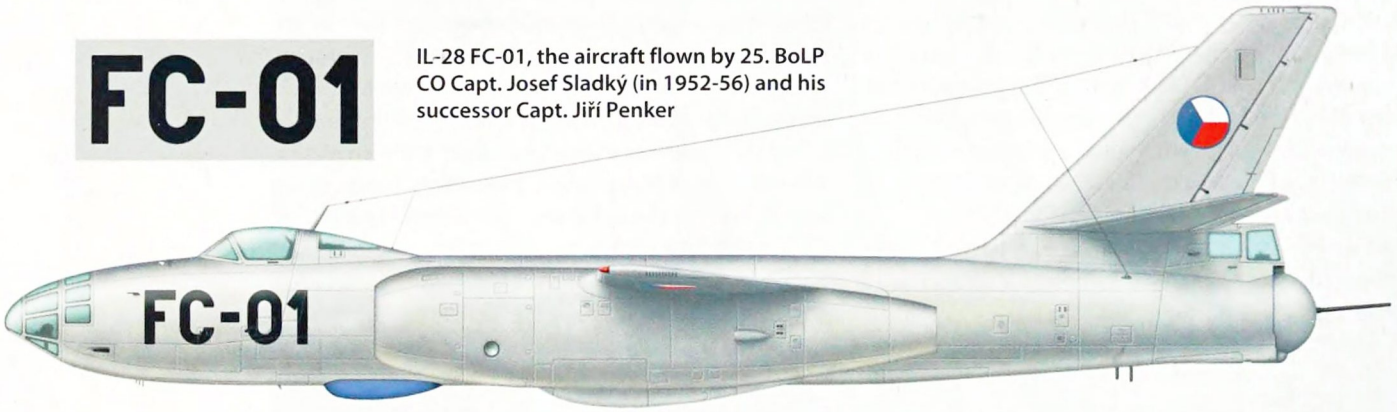
Conversely, the digits of the serial were *not* allocated randomly. Those in the 01-09 range denoted the division's or regiment's command flight (01 = Commanding Officer, 02 = Deputy CO, 03 = Chief Navigator, 04 = Chief of Aerial Gunnery etc.). The squadrons were allocated the ranges 10-29 for Sqn 1, 30-49 for Sqn 2, 50-69 for Sqn 3 etc. The numbers 10, 30 and 50 were reserved for the squadron commanders of Nos. 1-3 Squadrons, the numbers 11, 31 and 51 for the deputy squadron commanders, the numbers 12, 32 and 52 for the squadrons' political officers. The aircraft flown by ordinary pilots in Flight 1 of each squadron were marked 13 (yes), 33 and 53. The commanders of Flight 2 in the Nos. 1-3 Squadrons had 14, 34 and 54 allocated; ordinary pilots in these flights had 15, 17, 35, 37, 55 and 57 allocated, while Senior Pilots (a term reflecting skill, not age!) had 16, 36 and 56. The numbers for Flight 3 in the Nos. 1-3 Squadrons were 18 to 21, 38 to 41 and 58 to 61; the numbers for Flight 4 was 22 to 25, 42 to 45 and 62 to 65. Complicated as hell!

In the case of the IL-28 the serial was painted on the forward fuselage in huge characters, just like on jet fighters (not on the rear fuselage as had been common practice on earlier bombers). The serials were occasionally re-used if a squadron received a new aircraft to replace one which had been transferred to a different unit or had crashed. Sometimes, however, an aircraft kept its old serial after the transfer to another unit – at least for a while.

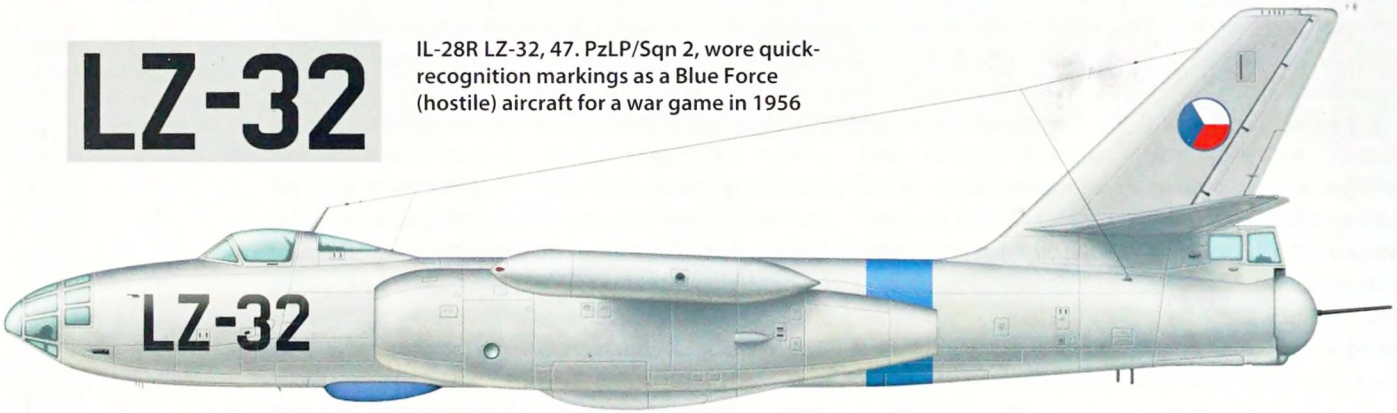
A new serial system (which is still in use by the Czech Air Force today) was introduced in June 1957; this no longer bore any relation to the units, with four-digit serials matching the last four of the aircraft's c/n. This obviated the need to change the serial if the aircraft changed hands, saving a lot of paperwork (and making it harder for spies to determine which aircraft belonged to which unit!). The serial was always painted on the rear fuselage and applied in smaller characters.

It should be noted that the aircrews *en masse* took a while to get to grips with the complex new hardware. Describing the situation as of 1st April 1957 in a report on the CzAF's combat readiness levels for the Defence Commission of the Czechoslovak Communist Party Central Committee, Vice-Minister of Defence Lt.-Gen. Josef Vosáhlo painted a pretty depressing picture. Because of the aforementioned shortage of PSBN-M radars only one-third of the IL-28s delivered to the CzAF came equipped with radars. These aircraft could act as leaders of bomber flights when it was necessary to deliver bomb strikes in IMC, the crews of radar-less IL-28s dropping their bombs when they saw the leader drop his. However, the crews had not yet been trained to use the radar at all. Moreover, only 100- and 250-kg (220- and 551-lb) bombs were available, the larger calibres were to be imported from the USSR later. Most of the crews were able to fly only in daytime VMC; in the 46. BoLD only four crews were able to fly in daytime IMC, and two of these were in the division's command flight.

This CzAF IL-28 has a post-1957 serial (obscured by the engine nacelle) and is equipped with a PB-28 brake parachute whose housing is visible on the open avionics bay access door.



IL-28 FC-01, the aircraft flown by 25. BoLP CO Capt. Josef Sladký (in 1952-56) and his successor Capt. Jiří Penker



IL-28R LZ-32, 47. PzLP/Sqn 2, wore quick-recognition markings as a Blue Force (hostile) aircraft for a war game in 1956

The second IL-28U serialled BA-10 in the 25. BoLP/Sqn 1 (c/n 69418), 1956-57

In contrast, IL-28R '1904' of the same 47. PzLP was a Red Force ('friendly') aircraft in a war game in the 1960s; note that the tip tanks are removed

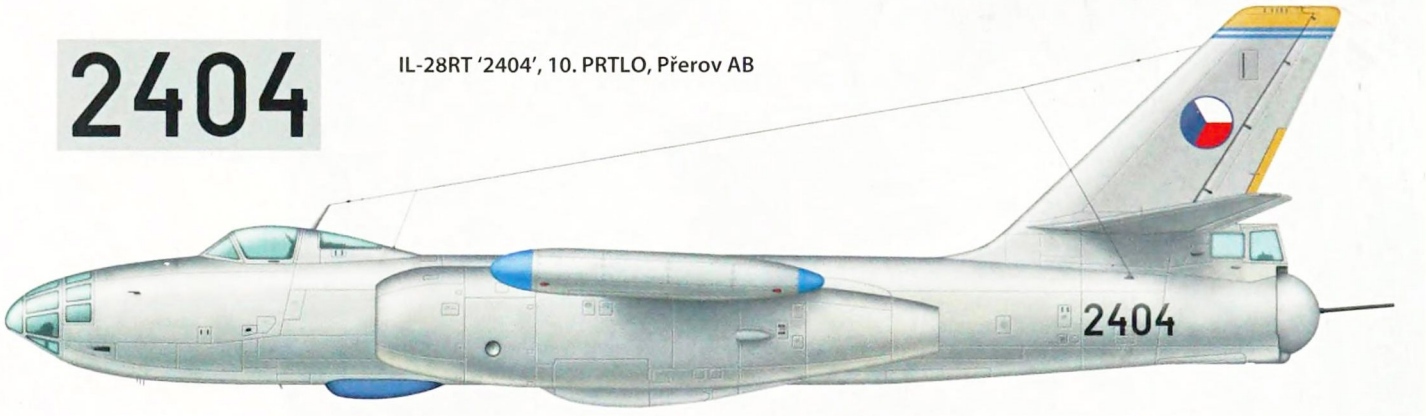
A fine air-to-air study of IL-28 FC-01 showing the mirror arrangement of the CzAF roundels' colours on the wings.

Three crews were cleared to fly in night VMC (again, two of them were in the division's command flight), and none at all were able to operate in night IMC! It was much the same story in the 47. PzLP.

One more special version in CzAF service was a target tug. In 1956 a single bomber thus modified was in service with the Target Towing Squadron (LVT – *letka vlečných terčů*) at Košice (Barca AB) which was mostly equipped with the locally developed MiG-15T and MiG-15*bis*T target tugs. This unit became the Target Towing Section (OVT – *Oddíl vlečných terčů*) in 1959 and was disbanded in 1966.

While we are on the subject of gunnery practice, it may be mentioned that, in addition to their primary missions, the IL-28s often served as targets for CzAF fighters which made practice intercepts and simulated

'Beware, beware, green elephants on parade!' CzAF personnel in full NBC protection outfits with long 'trunks' scrub an IL-28 during an NBC exercise, using a decontamination vehicle on a Praga V3S 6x6 army lorry chassis.



IL-28RT '2404', 10. PRTLO, Přerov AB

firing passes. As a rule, such sorties were uneventful, but one flight on 8th February 1956 almost ended in disaster and warrants a detailed description.

A 25. BoLP/command flight IL-28 serialled FC-02 and piloted by none other than 46. BoLD CO Josef Končír (by then promoted to colonel) took off from Přerov AB on an IMC training sortie, with Maj. Michal Ivanko as navigator and the division's Chief of Communications Capt. Šabatka as GRO. In this sortie it acted as a target for the Žatec-based 11. SLP (*stíhací letecký pluk* – Fighter Regiment) of the 3. SLD (*stíhací letecká divize* – Fighter Division). Because of a navigational error at a very early stage the *Beagle* started deviating from the desired track and getting dangerously close to the West German border. Meanwhile, the quick-reaction alert (QRA) duty pair of S-103s piloted by *nadporučík* (1st Lieutenant) Pavel Aron and *nadporučík* Drahoslav Hoření scrambled from Žatec AB for what looked at first like a routine practice intercept. Vectored by the 3. SLD command post, they soon found the bomber, 'shot it dead' with their gun cameras and headed back to base. Five minutes later, however, they were again ordered to intercept the IL-28, which by then had passed the point of no return for Přerov and was merrily continuing due west on a heading of 270°.

Aron and Hoření managed to find the wayward bomber and get the pilot's attention by rocking their wings and firing signal flares, whereupon the IL-28 followed them to Žatec. However, the weather at the base was poor, with heavy cloud and ground fog – horizontal visibility was no more than 1,000 m (3,280 ft). On entering the clouds Končír lost visual contact with his fighter escort; fearing a collision, he broke formation and attempted to land on his own. On the first try the bomber came in at an angle to the runway, narrowly missing the control tower in the fog, whereupon most of the personnel on the tower ran for their lives. On the second try Končír messed up the approach again, coming in too high, and had to make a go-around. The command post ordered him to eject, but then a

A Czechoslovak Air Force IL-28RT being manhandled. Note the wingtip ELINT pods whose both ends are dielectric.

complication arose – in addition to the navigator, for some reason a technician (*nadporučík* Tobiášek) was sitting on the jump seat in the navigator's station. This extra crew member had no parachute (!); hence Končír had to land by all means.

The ground personnel poured flammable liquid on the runway verges and ignited it to provide a visual reference for the bomber pilot. On the third try the IL-28 touched down at a small angle to the runway axis. During the preceding few days there had been heavy snowfalls, and the snow cleared from the runway was piled on the runway verges. Hitting the snow berm, the bomber veered off the runway and headed straight for the tower. The pilot promptly shut down the engines and stood on the brakes; the aircraft came to a halt just short of the tower, but not before the nose gear collapsed and the nose glazing shattered, scooping up a noseful of snow – the navigator and the technician had to be literally excavated. Luckily none of the crew was injured; however, they were summoned pronto by the new CzAF C-in-C Maj.-Gen. Jaroslav Týkal, and Col. Končír got chewed out. Oh yes, in case you wondered about the fighters – they landed safely.

The Czech *Beagles* were regular participants in local military parades and other special events. For example, the 1956 VE-Day parade featured a flypast by no fewer than 16 IL-28s. The grand show staged at Prague-Ruzyne airport on 2nd September 1956 was opened by a formation of three 29. BoLP IL-28s led by Maj. Jaroslav Hájek and closed by another IL-28 escorted by four MiG-15s, followed by three vics of three *Beagles*. Seven flights of IL-28s participated in the 1957 VE-Day in Prague, departing from Mladá AB; it was the same story in 1958, 1959 and 1960. On 4th September 1960 six flights of IL-28s took off from Pardubice to participate in the Air Force Day display at Prague-Ruzyne, landing at Přerov. Three of the bombers, including '6909' piloted by Capt. Metoděj Kristek and '6921' piloted by Capt. Emil Valčík, acted as 'troopships', dropping three parachutists each; after deploying their parachutes each group spectacularly unfurled a flag – the Czechoslovak national flag, the Soviet flag and the CzAF standard.

On 9th May 1962 the 25. BoLP sent four flights from Přerov to the parade in Bratislava. The last show performance of the CzAF IL-28s was on 30th April 1965 when four flights of bombers and four flights of MiG-21 *Fishbed* fighters took off from Ostrava-Mošnov airport (now called Leoš Janáček Airport) for a flypast over the city, which is 20 km (12.4 miles) to the north-east. En route the weather deteriorated to such an extent that the fighters' flight leader, who had led the formation during rehearsals, told the bombers' leader to take over (probably on the assumption that the bombers were better equipped to navigate in that kind of weather). The formation made the flypast right on schedule.

Business comes first, however, and the crews kept training. Training was not limited to 'home ground': in June 1956 nine aircraft were deployed to Hungary and three squadrons to East Germany to participate in Warsaw Pact exercises, acting as 'aggressor aircraft'. Depending on which side the aircraft were on, they were suitably marked by a red or blue stripe around the rear fuselage to denote Red Force ('good guys') and Blue Force ('bad guys') respectively.

The aircraft were progressively modified; for example, some radar-less bombers (usually one aircraft in each squadron) were retrofitted with the Rym-S targeting system. Some aircraft were fitted with spent case/belt link collectors under the tail turret.

In 1958, when the 46. BoLD was far from combat-ready, a far-reaching reorganisation of the CzAF was begun – mainly as a cost-cutting measure. The bomber force was hard hit by this reform. The first casualty was the 29. BoLP which was stood down in 1958, ceding ten *Beagles* plus one *Mascot* to the 25. BoLP and four bombers and the other trainer to the 24. BoLP. About the same time Sqn 3 of the 25. BoLP was disbanded and replaced by a reconnaissance squadron flying IL-28Rs transferred from the 47. PzLP. As of 1st July 1958 the CzAF had a total of 72 IL-28s on strength (55 bombers, eight trainers and nine IL-28Rs); by 1st October, according to some documents, only 60 remained.

Another factor was that the subsonic IL-28 was no longer considered a valuable asset; the CzAF command had set its sights on supersonic fighter-bombers capable of carrying tactical nukes. Hence it was decided to use the IL-28 for other purposes. Thus, selected *Beagles* were converted to IL-28RT ELINT aircraft and ECM aircraft.

The 24. BoLP was disbanded on 1st August 1960, followed by the 46. BoLD command a month later. This left the 25. BoLP as the sole tactical bomber unit, which was placed under the control of the 7th Air Force & Air Defence Army on 15th September 1960; a while earlier, on 19th July, its reconnaissance squadron was transferred to the 47. PzLP, which was now based at Pardubice. The aircraft of the former 24th Regiment were divided between the Air Force Reserve, the 25th Regiment, the 47th PzLP and the unnumbered squadron at Přerov training foreign pilots. One more training outfit operating the type in 1960 was the co-located 56. VL (*výcviková letka* – Training Squadron); this was disbanded on 1st September 1962.

A year later the 25. BoLP was resubordinated to the 1. SSMLS (*samostatný smíšený letecký sbor* – 1st Independent Composite Air Corps). The number of active *Beagles* dwindled steadily; the regiment finally disbanded on 19th May 1965 and the basic bomber version was retired. Its role was taken over by the supersonic Sukhoi Su-7BMK *Fitter-A* fighter-bomber whose deliveries to the CzAF started in mid-1964.

Shortly afterwards, however, a new IL-28 unit was established in Přerov – the 10. PRTLO (*protiradiotehnický letecký oddíl* – Electronic Warfare Air Section). It operated ten ECM aircraft roughly equivalent to the Soviet IL-28PP version. The unit disbanded on 1st July 1969, transferring its aircraft to Sqn 5 of the 47. PzLP.

The trainer, reconnaissance and ECM versions remained in service until 31st August 1973. By 1977 all CzAF IL-28s, except four aircraft displayed at the Military Museum at Prague-Kbely airfield, had either been scrapped or had ended up as target drones or gunnery targets at practice ranges.

IL-28 operations in Czechoslovakia were not accident-free. Between 1956 and 1969 a total of ten aircraft – six bombers, three IL-28Rs and a single IL-28U – were lost in seven fatal accidents and three non-fatal accidents (total hull losses). A further 16 non-fatal accidents during the same time frame were partial losses, the aircraft being repaired.

It deserves mention that Czechoslovakia served as a training ground for *Beagle* crews from Egypt, Syria, Indonesia, Nigeria and a few other countries. The conversion training took place at Prague-Kbely AB, Přerov AB and (later) Mladá AB, where a special squadron was set up.

As mentioned in Chapter 4, a single IL-28 was used by VZLÚ as an engine testbed at Prague-Letňany between 1958 and 1970. The Walter M-701 turbojet and Ivchenko AI-25TL turbofan passed their tests on this aircraft.

A total of 77 IL-28s – 55 bombers (including 37 'IL-28Bs'), nine IL-28Us and ten IL-28Rs – were delivered to Czechoslovakia. CzAF IL-28s are listed below. Unfortunately not all pre-1957 alphanumeric serials can

Known Czechoslovak Air Force IL-28s

Serial	Version	C/n	Notes
a) old serial system (1955-57)			
AC-50	IL-28U (CB-228)	65010312	24. BoLP/Sqn 3, later to 29. BoLP without serial change; returned by 12-1956. Became BA-18
AC-51	IL-28R (B-228R)	41911	24. BoLP/Sqn 3, operated 1-1-1956 to 14-5-1956. Became PU-14
AC-52	IL-28R (B-228R)	41912	24. BoLP/Sqn 3, operated 1-1-1956 to 14-5-1956. Became PU-15
AC-55	IL-28 (B-228)	52218	Irkutsk-built, D/D 1956. 24. BoLP/Sqn 3. Became 2218
AD-31	IL-28 (B-228)	56757	Moscow-built, full c/n 55006757. 25. BoLP/Sqn 2. Transferred to 29. BoLP by 12-1956, new serial unknown. Became 6757
AD-32	IL-28 (B-228)*	56918	Moscow-built, full c/n 55006918. 25. BoLP/Sqn 2. Transferred to 24. BoLP 5-9-1956, new serial unknown. Became 6918
AD-33	IL-28 (B-228)	56909	Moscow-built, full c/n 55006909. 25. BoLP/Sqn 2. Transferred to 29. BoLP by 12-1956, new serial unknown. Became 6909
AD-34	IL-28 (B-228)	57019	Moscow-built, full c/n 55007019. 25. BoLP/Sqn 2. Became CD-14 (or CD-19?)
AD-35	IL-28 (B-228)	56923	Moscow-built, full c/n 55006923. 25. BoLP/Sqn 2. Possibly became TH-11
AD-41	IL-28U (CB-228)	65010612	25. BoLP/Sqn 2. Became PU-10
BA-10 (1)	IL-28U (CB-228)	65010316	25. BoLP/Sqn 1 (1955-56). To 29. BoLP, new serial unknown. Became 0316
BA-10 (2)	IL-28U (CB-228)	69418	Full c/n 65009418, D/D 1956. 25. BoLP/Sqn 1. Damaged Přerov AB 3-3-1956 but repaired. To 24.BoLP, new serial unknown. Crashed near Přerov 6-2-1957, crew killed
BA-11 (1)	IL-28 (B-228)	56775	Moscow-built, full c/n 55006775. 25. BoLP/Sqn 1. Possibly became TH-14
BA-11 (2)	IL-28 (B-228)*	56926	Ex-DE-51. 25. BoLP/Sqn 1, Became 6926
BA-12	IL-28 (B-228)	56943	Moscow-built, full c/n 55006943. 25. BoLP/Sqn 1; to 24. BoLP without serial change. Became 6943
BA-13	IL-28 (B-228)	56912	Moscow-built, full c/n 55006912. 25. BoLP/Sqn 1. Became PK-34
BA-14	IL-28 (B-228)*	56935	Moscow-built, full c/n 55006935. 25. BoLP/Sqn 1. Became 6935
BA-16	IL-28 (B-228)	57021	Moscow-built, full c/n 55007021. 25. BoLP/Sqn 1. Became 7021
BA-18	IL-28U (CB-228)	65010312	Ex-AC-50. 25. BoLP/Sqn 1. Became 0312
CD-10	IL-28U (CB-228)	610501	Full c/n 65010501. 24. BoLP/Sqn 1. Became 0501
CD-11	IL-28 (B-228)	56435	Moscow-built, full c/n 55006435. 24. BoLP/Sqn 1. Became 6435
CD-12	IL-28R (B-228R)	41910	24. BoLP/Sqn 1, operated 1-1-1956 to 14-5-1956. Became PU-13
CD-13	IL-28R (B-228R)	41914	24. BoLP/Sqn 1, operated 1-1-1956 to 14-5-1956. Became LZ-34
CD-14 (?)	IL-28 (B-228)	57019	Also reported as CD-19! Ex-AD-34. 24. BoLP/Sqn 1. Damaged Přerov AB 23-5-1956 but repaired (did not crash 23-3-1956!); ultimate fate unknown
DE-50 (1)	IL-28 (B-228)	56457	Moscow-built, full c/n 58006457. 25. BoLP/Sqn 3; later to 29. BoLP without serial change. Became RL-52
DE-50 (2)	IL-28 (B-228)*	52111	Irkutsk-built, D/D 1956. 25. BoLP/Sqn 3. Became 2111
DE-51	IL-28 (B-228)*	56926	Moscow-built, full c/n 55006926. 25. BoLP/Sqn 3. Became BA-11 (2)
DE-52	IL-28 (B-228)	56915	Moscow-built, full c/n 55006915. 25. BoLP/Sqn 3, to 24. BoLP without serial change. Became 6915
DE-53	IL-28 (B-228)*	56929	Moscow-built, full c/n 55006929. 24. BoLP/Sqn 1. To 24. BoLP by 12-1956, new serial unknown. Became 6929
DE-55	IL-28 (B-228)	56903	Moscow-built, full c/n 55006903. 25. BoLP/Sqn 3. To 29. BoLP by 5-1956, new serial unknown. Became 6903
DE-61	IL-28U (CB-228)	610502	Full c/n 65010502. 25. BoLP/Sqn 3. Became 0502
EB-30	IL-28U (CB-228)	65010315	24. BoLP/Sqn 2. Became 0315

EB-31	IL-28 (B-228)	56953	Moscow-built, full c/n 55006953. 24. BoLP/Sqn 2. Became 6953
EB-32	IL-28 (B-228)	56921	Moscow-built, full c/n 55006921. 24. BoLP/Sqn 2. Became 6921
EB-33	IL-28R (B-228R)	41913	24. BoLP/Sqn 2, operated 1-1-1956 to 14-5-1956. Became LZ-33
FC-01	IL-28 (B-228)	56804	Moscow-built, full c/n 55006804. 25. BoLP/command flight. Became 6804
FC-02	IL-28 (B-228)	57027	Moscow-built, full c/n 55007027. 25. BoLP/command flight. Damaged Žatec AB 8-2-1956 but repaired. Became 7027
LB-02	IL-28 (B-228)	?	46. BoLD/command flight
LZ-31	IL-28R (B-228R)	41917	47. PzLP/Sqn 2, transferred by 14-5-1956, no serial before that. Became 1917
LZ-32	IL-28R (B-228R)	41918	47. PzLP/Sqn 2, transferred by 14-5-1956, no serial before that. Crashed Mladá AB 15-5-1957, crew OK
LZ-33	IL-28R (B-228R)	41913	Ex-EB-33. 47. PzLP/Sqn 2, D/D 1956. Became 1913
LZ-34	IL-28R (B-228R)	41914	Ex-CD-13. 47. PzLP/Sqn 2, D/D 1956. Became 1914
OV-03	IL-28R (B-228R)	41904	47. PzLP/command flight, transferred by 14-5-1956, no serial before that. Became 1904
PK-30	IL-28 (B-228)	?	29. BoLP/Sqn 2
PK-32	IL-28 (B-228)	52302	Irkutsk-built, D/D 1956. 29. BoLP/Sqn 2. Became 2302
PK-34	IL-28 (B-228)	56912	Ex-BA-13. 29. BoLP/Sqn 2. Became 6912
PU-10	IL-28U (CB-228)	65010612	Ex-AD-41. 47. PzLP/Sqn 1, D/D 1956. Became 0612
PU-11	IL-28R (B-228R)	41916	47. PzLP/Sqn 1, transferred by 14-5-1956, no serial before that. Became 1916
PU-12	IL-28R (B-228R)	41915	47. PzLP/Sqn 1, transferred by 14-5-1956, no serial before that. Became 1915
PU-13	IL-28R (B-228R)	41910	Ex-CD-12. 47. PzLP/Sqn 1, D/D 1956. Became 1910
PU-14	IL-28R (B-228R)	41911	Ex-AC-51. 47. PzLP/Sqn 1, D/D 1956. Became 1911
PU-15	IL-28R (B-228R)	41912	Ex-AC-52. 47. PzLP/Sqn 1, D/D 1956. Became 1912
RL-50	IL-28 (B-228)	52307	Irkutsk-built, D/D 1956. 29. BoLP/Sqn 3. Became 2307
RL-52	IL-28 (B-228)	56457	Ex-DE-50 (1). 29. BoLP/Sqn 3. Became 6457
TH-11	IL-28 (B-228)	56923?	Ex-AD-35? 29. BoLP/Sqn 1; c/n to serial tie-up not confirmed, see next line! Possibly became 6923
TH-11	IL-28 (B-228)	55006823?	Reported as such but this c/n not mentioned in Czech sources! 29. BoLP/Sqn 1
TH-14	IL-28 (B-228)	56775?	Ex-BA-11 (1)? 29. BoLP/Sqn 1; c/n to serial tie-up not confirmed. Possibly became 6775
no serial	IL-28R (B-228R)	41904	25. BoLP, D/D 1956. Became OV-03
no serial	IL-28R (B-228R)	41915	25. BoLP, D/D 1956. Became PU-12 by 14-5-1956
no serial	IL-28R (B-228R)	41916	25. BoLP, D/D 1956. Became PU-11 by 14-5-1956
no serial	IL-28R (B-228R)	41917	25. BoLP, D/D 1956. Became LZ-31
no serial	IL-28R (B-228R)	41918	25. BoLP, D/D 1956. Became LZ-32
b) new serial system (1957 onwards)			
0116	IL-28U	65010116	Pre-1957 serial unknown. 29. BoLP, later 24. BoLP and 47. PzLP
0117	IL-28U	65010117	Pre-1957 serial unknown. 29. BoLP, later 24. BoLP and 25. BoLP. SOC Přerov 19-11-1966
0312	IL-28U	65010312	Ex-BA-18. 25. BoLP. To 56. VL. SOC Přerov 3-2-1965
0315	IL-28U	65010315	Ex-EB-30. 24. BoLP. To foreign student training squadron and 56. VL in 1960; later 10. PRTLO, still later 47. PzLP. SOC LOK ‡ 2-2-1967, GIA Antonín Zápotocký Military Academy (VAAZ), Brno; scrapped 1975
0316	IL-28U	65010316	Ex-BA-10 (1). 25. BoLP. SOC Přerov 3-2-1965
0501	IL-28U	610501	Ex-CD-10. In 1960 transferred consecutively to 24. BoLP, foreign student training squadron and 56. VL; later 10. PRTLO, still later 47. PzLP. Preserved VM VHÚ†, Prague-Kbely
0502	IL-28U	610502	Ex-DE-61. 25. BoLP. To 24. BoLP, later back to 25. BoLP. SOC Přerov 23-3-1964
0612	IL-28U)	65010612	Ex-PU-10. Foreign student training squadron and 56. VL in 1960, later 25. BoLP. SOC Pardubice
1904	IL-28R	41904	Ex-OV-03. 47. PzLP
1910	IL-28R	41910	Ex-PU-13. 47. PzLP
1911	IL-28R	41911	Ex-PU-14. 47. PzLP. Crashed Mladá AB 28-1-1965, crew killed
1912	IL-28R	41912	Ex-PU-15. 47. PzLP
1913	IL-28R	41913	Ex-LZ-33. 47. PzLP
1914	IL-28R	41914	Ex-LZ-34. 47. PzLP
1915	IL-28R	41915	Ex-PU-12. 47. PzLP. Crashed Pardubice AB 22-5-1969, crew killed
1916	IL-28R	41916	Ex-PU-11. 47. PzLP
1917	IL-28R	41917	Ex-LZ-31. 47. PzLP
2104	IL-28	52104	Irkutsk-built, D/D 1956; pre-1957 serial unknown. 24. BoLP, to 25. BoLP by 1962. SOC Přerov 3-2-1965
2105	IL-28	52105	Irkutsk-built, D/D 1956; pre-1957 serial unknown. 29. BoLP. Damaged Mladá AB 7-5-1958 but repaired. To 24. BoLP in 1959, to 56. VL in 1960. SOC Přerov 3-2-1965
2106	IL-28*	52106	Irkutsk-built, D/D 1956; pre-1957 serial unknown. 29. BoLP. Damaged 23-2-1959 and 23-7-1962 but repaired. SOC LOK 6-11-1964

2107	IL-28	52107	Irkutsk-built, D/D 1956; pre-1957 serial unknown. 25. BoLP. Stored VM VHÚ reserve
2108	IL-28	52108	Irkutsk-built, D/D 1956; pre-1957 serial unknown. 25. BoLP. SOC Přerov 19-11-1966
2109	IL-28	52109	Irkutsk-built, D/D 1956; pre-1957 serial unknown. 29. BoLP; damaged 5-9-1957 but repaired. To 24. BoLP in 1959; to 56. VL in 1960. Transferred to Poland 6-12-1965 as a replacement for a Polish Air Force IL-28 lost in a collision with a CzAF MiG-19PM near Prague 10-4-1964
2110	IL-28	52110	Irkutsk-built, D/D 1956; pre-1957 serial unknown. 24. BoLP; to Air Force Reserve 1961, to 25. BoLP by 1965. SOC Přerov 19-11-1966
2111	IL-28*	52111	Ex-DE-50 (2). 25. BoLP, tail turret with case collector. In 1960 transferred consecutively to 24. BoLP, foreign student training squadron and 56. VL. SOC Přerov 19-11-1966
2112	IL-28	52112	Irkutsk-built, D/D 1956; pre-1957 serial unknown. 24. BoLP. Crashed 70 km (43.5 miles) from Warsaw 30-6-1959, two crewmembers killed
2113	IL-28	52113	Irkutsk-built, D/D 1956; pre-1957 serial unknown. 24. BoLP; to Air Force Reserve. SOC Přerov 10-12-1963
2114	IL-28	52114	Irkutsk-built, D/D 1956; pre-1957 serial unknown. 25. BoLP. Converted to, see next line
	IL-28RT		10. PRTLO, ELINT version; later 47. PzLP. SOC Pardubice 1970
2115	IL-28	52115	Irkutsk-built, D/D 1956; pre-1957 serial unknown. 29. BoLP. Crashed Mladá AB 8-8-1957, crew OK
2116	IL-28	52116	Irkutsk-built, D/D 1956; pre-1957 serial unknown. 24. BoLP, later 25. BoLP. SOC Přerov 23-3-1964
2117	IL-28	52117	Irkutsk-built, D/D 1956; pre-1957 serial unknown. 25. BoLP. Damaged 21-1-1959 but repaired. SOC Přerov 23-3-1964
2216	IL-28	52216	Irkutsk-built, D/D 1956; pre-1957 serial unknown. 24. BoLP. Damaged 17-2-1959 but repaired. Converted to, see next line
	IL-28RT		10. PRTLO, ECM version, later 47. PzLP. SOC Pardubice 1970
2217	IL-28	52217	Irkutsk-built, D/D 1956; pre-1957 serial unknown. 24. BoLP, to 25. BoLP/Sqn 3. Crashed Přerov AB 19-1-1965, crew OK
2218	IL-28	52218	Ex-AC-55. 24. BoLP/Sqn 2. Crashed near Přerov 19-11-1957, crew killed
2219	IL-28	52219	Irkutsk-built, D/D 1956; pre-1957 serial unknown. 25. BoLP. SOC Pardubice 7-10-1965
2220	IL-28	52220	Irkutsk-built, D/D 1956; pre-1957 serial unknown. 25. BoLP. SOC LOK 22-2-1966
2301	IL-28	52301	Irkutsk-built, D/D 1956; pre-1957 serial unknown. 25. BoLP. SOC Přerov 1966
2302	IL-28	52302	Ex-PK-32. 24. BoLP, later 25. BoLP. Converted to, see next line
	IL-28RT		10. PRTLO, ELINT version, later 47. PzLP. SOC Pardubice 1970
2303	IL-28	52303	Irkutsk-built, D/D 1956; pre-1957 serial unknown. 29. BoLP, later 25. BoLP. Converted to, see next line
	IL-28RT		10. PRTLO, later 47. PzLP, ELINT version. Stored VM VHÚ reserve; sometimes reported in error as 3303, which did not exist
2304	IL-28	52304	Irkutsk-built, D/D 1956; pre-1957 serial unknown. 29. BoLP, to 24. BoLP in 1959. To Air Force Reserve 1960, SOC 21-6-1963
2305	IL-28	52305	Irkutsk-built, D/D 1956; pre-1957 serial unknown. 29. BoLP, later 25. BoLP, still later 10. PRTLO, still later 47. PzLP. SOC Pardubice 1970
2307	IL-28	52307	Ex-RL-50. 24. BoLP, later 25. BoLP. Converted to, see next line
	IL-28RT		10. PRTLO, still later 47. PzLP. SOC Pardubice 1971
2308	IL-28	52308	Irkutsk-built, D/D 1956; pre-1957 serial unknown. 24. BoLP, later foreign student training squadron, to 56. VL in 1960. SOC LOK 6-11-1964
2309	IL-28	52309	Irkutsk-built, D/D 1956; pre-1957 serial unknown. 24. BoLP, later foreign student training squadron, to 56. VL in 1960. SOC Přerov 23-3-1964
2310	IL-28	52310	Irkutsk-built, D/D 1956; pre-1957 serial unknown. 29. BoLP, to 24. BoLP in 1959, later 25. BoLP. Converted to, see next line
	IL-28RT or RTR		10. PRTLO, still later 47. PzLP. SOC Pardubice 1971
2311	IL-28	52311	Irkutsk-built, D/D 1956; pre-1957 serial unknown. 25. BoLP. SOC Přerov 19-11-1966
2312	IL-28	52312	Irkutsk-built, D/D 1956; pre-1957 serial unknown. 24. BoLP. To Air Force Reserve 1960, SOC Přerov 19-11-1966
2313	IL-28	52313	Irkutsk-built, D/D 1956. 29. BoLP, to 25. BoLP by 12-1956. Damaged Brno-Tuřany 7-1-1960 but repaired. SOC Přerov 19-11-1966
2319	IL-28	52319	Irkutsk-built, D/D 1956; pre-1957 serial unknown. 25. BoLP. Crashed Přerov 12-2-1961, one crewmember killed
2401	IL-28	52401	Irkutsk-built, D/D 1956; pre-1957 serial unknown. 25. BoLP, damaged 7-1-1960 but repaired. To 24. BoLP by 8-1960, to 56. VL 9-1960. Damaged 23-7-1962 but repaired. SOC Přerov 23-4-1963
2402	IL-28	52402	Irkutsk-built, D/D 1956; pre-1957 serial unknown. 29. BoLP. Damaged Prague-Kbely 22-7-1958 but repaired, later 25. BoLP. SOC Přerov 23-3-1964
2403	IL-28	52403	Irkutsk-built, D/D 1956; pre-1957 serial unknown. 29. BoLP, to 25. BoLP by 12-1962. Converted to, see next line
	IL-28RT or RTR		10. PRTLO, later 47. PzLP. SOC Pardubice 1970
2404	IL-28	52404	Irkutsk-built, D/D 1956; pre-1957 serial unknown. 24. BoLP. Damaged by taxying ČSA Czechoslovak Airlines IL-14 OK-LCD 29-9-1959 but repaired, later to 25. BoLP. Converted to, see next line
	IL-28RT		10. PRTLO, later 47. PzLP. Preserved *Nadace Letecké Historické Společnosti Výškov* (Výškov Aviation Historical Society Collection), Slatina
2405	IL-28	52405	Irkutsk-built, D/D 1956; pre-1957 serial unknown. 25. BoLP. SOC Přerov 19-11-1966
6435	IL-28	56435	Ex-CD-11. 24. BoLP. To Air Force Reserve 1960, later 25. BoLP. SOC Přerov 1965
6457	IL-28	56457	Ex-RL-52. 25. BoLP. SOC P_erov 23-3-1964
6756	IL-28 (B-228)	56756	Moscow-built, full c/n 55006756; pre-1957 serial unknown. 25. BoLP; to 29. BoLP 5-9-1956, to 25. BoLP by 4-1965
6757	IL-28 (B-228)	56757	Ex-AD-31. 24. BoLP; to 25. BoLP after 1960. Possibly converted to, see next line
	IL-28RT		10. PRTLO, later 47. PzLP. SOC Pardubice 1970
6775	IL-28	56775	Ex-TH-14? 25. BoLP. SOC Přerov 19-11-1966
6804	IL-28	56804	Ex-FC-01. 25. BoLP. Converted to, see next line
	IL-28RT or RTR		10. PRTLO, later 47. PzLP. SOC Pardubice 1970
6903	IL-28	56903	Ex-DE-55. 24. BoLP, to 25. BoLP after 1960. SOC Přerov 3-2-1965

6909	IL-28	56909	Ex-AD-33. Damaged 24-10-1959 but repaired. SOC Přerov 23-3-1964
6912	IL-28	56912	Ex-PK-34. 25. BoLP. Damaged 9-2-1959 but repaired. Converted 20-4-1965 to, see next line
	IL-28RT or RTR		10. PRTLO, ECM version, later 47. PzLP. SOC LOK 1975
6915	IL-28	56915	Ex-DE-52. Converted to engine testbed, operated by VZLÚ 1958-70. To VZS-031 test centre, SOC 1972
6918	IL-28*	56918	Ex-AD-32. 25. BoLP. SOC Přerov 19-11-1966
6919	IL-28 (B-228)	56919	Moscow-built, full c/n 55006919; not listed in Czech sources! Converted to, see next line
	IL-28RT		10. PRTLO, ECM version
6921	IL-28	56921	Ex-EB-32. 25. BoLP; damaged 9-2-1959 but repaired. To 24. BoLP by 4-1959, back to 25. BoLP after 1960. SOC Přerov 23-3-1964
6923	IL-28	56923	Ex-TH-11? 25. BoLP. Damaged 8-4-1959 but repaired. SOC P_erov 19-11-1966
6926	IL-28*	56926	Ex-BA-11 (2). 25. BoLP. Converted to, see next line
	IL-28RTR		10. PRTLO, later 47. PzLP. Preserved VM VHÚ wearing both 6926 on rear fuselage and BA-11 (with DE-51 showing through) on nose
6929	IL-28*	56929	Ex-DE-53. 29. BoLP. Crashed near Poličná 26-8-1958, two crewmembers killed
6935	IL-28*	56935	Ex-BA-14. 25. BoLP. Converted to, see next line
	IL-28RTR		10. PRTLO, later 47. PzLP. SOC Brno-Černovice 1972
6943	IL-28	56943	Ex-BA-12. 24. BoLP, later 25. BoLP. SOC Přerov 19-11-1966
6953	IL-28	56953	Ex-EB-31. 24. BoLP. Retrofitted with Rym-S system 9-1956. To 25. BoLP after 1960. SOC Přerov 1965
7021	IL-28	57021	Ex-BA-16. Converted to, see next line
	IL-28RT		10. PRTLO, ECM version, later 47. PzLP. SOC Pardubice 1970
7027	IL-28	57027	Ex-FC-02. To 24. BoLP, ultimate fate unknown
not known	IL-28 (B-228)	53004665?	Reported as delivered to Czechoslovakia but not listed in Czech sources, probably an error!

* Equipped with PSBN-M radar, which some Czech publications refer to as the PSBN-M-8.

† VM VHÚ = *Vojenské muzeum Vojenského historického ústavu* – Military Museum of the Military Historical Society.

‡ LOK = *Letecké opravný Kbely* – the CzAF's aircraft repair plant at Prague-Kbely A

be linked to specific aircraft. For example, if AC-52 and AC-55 have been identified, this means IL-28s serialled AC-53 and AC-54 also existed but their versions, c/ns and later serials are unknown. The same applies to the serials AD-30, AD-36 through AD-40, BA-15, BA-17, BC-01, BC-02, BC-03, DE-54, DE-56 through DE-60, FH-01, FH-02, FH-03, LB-01, LB-03, LZ-30, OV-01, OV-02, TH-10, TH-12, TH-13, PK-31 and PK-33; the code RL was presumably not used at all because the 29. BoLP did not have enough aircraft for Sqn 3. Since many aircraft changed their identity repeatedly, the original serial is in bold type where known.

In 1957 Czech sportsmen used the IL-28 for setting several Class G-II-b world records. The idea was born when the Czechs won every possible medal at the 3rd World Skydiving Championship held at Moscow-Tushino in 1956; the catch phrase of the day was 'The students have surpassed the teachers'. Of course, the winners were treated like national heroes. Among other things, they were invited to an audience with the then-President of Czechoslovakia Antonín Zápotocký who asked them in a private conversation what he could do for them. Seizing the opportunity, absolute world champion Gustav Koubek said they would like to make a jump from high altitude in order to glorify their homeland, but only the Air Force had aircraft which could take them high enough – specifically, the IL-28 bomber which could accommodate a team of skydivers in the bomb bay. The President tasked the then-Minister of Defence Army Gen. Bohumír Lomský with providing assistance; the minister, in turn, gave appropriate orders to Vice-Minister Lt.-Gen. Josef Vosáhlo, who was in charge of the Air Force and the National Air Defence Force.

The military were obviously not overjoyed about this unexpected task, let alone the prospect of letting civilians use their aircraft. Since this was a presidential task, they could not just give Koubek and his team the run-around; hence they tried to scare the unwanted 'guests' off. At the first meeting with Lt. Gen. Vosáhlo the sportsmen got bawled out by his aides who kept telling them they would get incinerated by the engine exhaust, or freeze 'like rabbits' (*sic*) at high altitude, or get smashed to death against the aircraft's fuselage by the slipstream, or their lungs would burst and they would suffocate. But Koubek and his team would not be put off that easily and demanded persistently that a test with a dummy be performed at first. Grudgingly the military agreed, guaranteeing the skydivers' safety until the moment they left the aircraft.

The skydivers got their first look at the IL-28's bomb bay at Mladá AB, discussing the modifications which needed to be made to the aircraft with the local technicians. A 29. BoLP/Sqn 1 IL-28 serialled TH-14 was equipped with a cine camera mounted ahead of the bomb bay instead of the radome to check the dummy's trajectory after leaving the bay. Later, 'live' jumps were made by Air Force parachutists – Juraj Kováč, Miroslav Bílek and a group comprising Leopold Ozábal, Zdeněk Poes and Přívratský (first name unknown).

Meanwhile, the sportsmen were preparing in earnest for the record attempt. Special heat-insulated and wind-proof clothing, including double leather gloves and face masks of the kind worn by anti-terrorist

The record-breaking team of Czechoslovak skydivers: (left to right) Jaroslav Jehlička, Gustav Koubek and Zdeněk Kaplan.

troops, was made to protect them from the slipstream and the killing cold of the stratosphere. The skydivers trained in a pressure chamber, with physicians monitoring their health; two of the candidates failed to pass this test. Then the aircraft was lightened by removing the cannons, the bomb bay doors were lined with thick felt to reduce the risk of injuries, special suspension belts were installed as a safety measure to restrain the parachutists until the aircraft climbed to a safe altitude, and the bomb bay was fitted out with an oxygen system, an intercom, lights and additional cameras.

Prior to the record attempt the three skydivers – Jaroslav Jehlička, Zdeněk Kaplan and Gustav Koubek – made two practice jumps from 6,000 m (19,685 ft) and

Looking almost like space invaders in their heat-insulated suits and face masks with oxygen hoses, the trio pose for the press at Mladá AB on 21st March 1957 before boarding the aircraft.

9,000 m (29,530 ft). An unexpected complication arose on the latter occasion – the barographs which were to record the altitude during the jump froze and failed. A special frost-resistant lubricant had to be developed urgently and all of the skydivers' equipment – altimeters, barographs, chronometers, KAP-3 parachute timers, KP-15 oxygen kits – was tested at –60°C (–76°F) and simulated altitudes up to 13,000 m (42,650 ft). Incidentally, each man's equipment, including the PD-47 main parachute (*para**shoot** desahnt**nyy*** – trooper's parachute, 1947 model) and the PZ-47 reserve parachute (*para**shoot** zapas**noy***), weighed 60 kg (132 lb).

After several days' wait caused by adverse weather, the day of 21st March 1957 dawned at Mladá AB with a clear blue sky. With a host of photographers and journalists (all of whom had been screened by the Czech secret service) watching, the three skydivers went through the pre-flight preparations and climbed into the aircraft. At 0807 hrs local time IL-28 TH-14 piloted by Maj. Jaroslav Hájek took off, accompanied by a UTI-MiG-15 (Aero CS-102) as a camera ship to film the jump.

As far as the pilot was concerned, this was pretty much a normal flight, except for the need to slow down as much as possible before the drop in order to minimise the skydivers' exposure to the slipstream. The greatest responsibility rested with the navigator who had to determine the correct moment of the drop; should the ground be obscured by clouds, the moment of the drop would be calculated. When the bomber climbed to maximum altitude, at 0859 hrs Jehlička, Kaplan and Koubek left the bomb bay at 12,580 m (41,273 ft), falling free 11,664 m (38,267 ft) before opening their parachutes at 916 m (3,005 ft).

The photos were promptly circulated the following day, but not before they had been checked by the counter-intelligence department to make sure no classified details would be leaked to the press. Deleting serials and such from photos of combat aircraft intended for the media was common practice in those days, but this time the military censor surpassed themselves, retouching away the generator cooling ram air intakes on the engine air intake centrebodies, which they mistook for cannons! Zeal makes up for lack of knowledge, eh?.. or, as a Russian colloquial expression goes, a fool with initiative is more dangerous than an ordinary fool.

Zdeněk Kaplan recounted the record-breaking jump as follows. *'After climbing to 1,500 m [4,920 ft] we let ourselves down to the bottom of the bomb bay; a while later we armed the parachute timers* (these had been set to 1,000 m/3,280 ft – *Auth.*). *We were seated back to front; I was foremost, with Gusta* (Gustav Koubek – *Auth.*) *between my thighs and Jarda* (Jaroslav Jehlička – *Auth.*) *ahead of him. At an altitude of 7,000 m [22,965 ft] we started feeling the bitter cold. The pilots (sic), who were*

Filmed from a CS-102 chase plane, the three skydivers jump from (or rather fall out of) IL-28 TH-11. Note the cine camera supplanting the radome and the apparent absence of the cannons.

sitting in a pressurised and heated cockpit, checked on us from time to time over the intercom; we invariably answered, 'Nos. 1, 2, 3 all OK'. Anyway, we had promised each other before the flight that even if one of us should pass out, the others would report for him. In the headphones of my helmet I could hear Jehlička urging the pilots to a little higher still. The aircraft captain, Jaroslav Hájek, told him this was as far as the aircraft would go; whatever altitude it gained [when flying in a straight line] it would lose when making a turn. We were instructed to disconnect our oxygen masks from the on-board oxygen system. The two-way valves that were part of our gear instantly switched us to the KP-15 individual breathing apparatus with enough oxygen for 15 minutes. Then came the final countdown and finally the captain's terse order, 'Go!'

It was five seconds to nine. The hydraulic pressure instantly opened the bomb bay doors (sic; in reality the bomb bay doors are pneumatically actuated – *Auth.). A dazzling light entered the bay, and we fell out into the hurricane raging outside. The ambient temperature was –56°C [–68.8°F], the aircraft's speed 550 km/h [341 mph], the ambient pressure 144 mm Hg, the altitude attained was 12,580 m. Jarda fell away immediately; I sub-consciously kept holding Gusta between my knees, and for a while we were falling together. Finally we parted company and started falling earthwards, tumbling head over heels. In the rarefied air, in just 20 seconds we accelerated to 360 km/h [223 mph] as we fell. It was hard to keep the body stretched out for three minutes and fifteen seconds; our strength was rapidly dwindling. At 1,000 m we felt the parachute timers tugging at our fingers* (the timer was tied by a cord to the middle finger of the left hand – *Auth.); we counted to nine and then opened the 'chutes after falling more than 11,000 m [36,090 ft]. [...] When they helped us extricate ourselves from the parachute harness and all the other paraphernalia we were wearing, we were as happy as could be. Afterwards we went to say thank you and give a hug to the crew of the aircraft involved – pilot Hájek, navigator Kaplan and radio operator Mixa.'*

Not content with this remarkable achievement, the same trio decided to make a second stratospheric jump right away – at night, which made it even more complicated. The decision makers who were to authorise this jump could not believe that the skydivers could get their bearings and maintain the correct attitude in the darkness. In an effort to overcome their mistrust Zdeněk Kaplan made a parachute jump blindfolded, which was duly documented on film.

The same IL-28 with the same crew was involved. The first attempt on 25th March 1957 went haywire when Jaroslav Jehlička's parachute pack suddenly opened inside the aircraft and the mission was aborted; it turned out that the rip cord was too short. The second attempt was scheduled for 2300 hrs on 27th March – and was nearly called off because a storm front was approaching, forcing a take-off ahead of schedule. At 2115 hrs the bomber with Jehlička, Kaplan and Koubek aboard took off from Mladá AB, climbing to 12,518 m (41,069 ft) in 41 minutes. A powerful searchlight was set up at a practice ground 2 km (1.24 miles) from the

airbase, shining vertically into the sky to designate the drop zone; others were arranged at the airfield.

At 2156 hrs the skydivers jumped and glided towards the airfield, falling free 12,082 m (39,639 ft) before opening their parachutes. Zdeněk Kaplan recounted later that the night jump was far more difficult psychologically – everything below was pitch dark, the phosphorescent altimeter needles were whirling round like crazy, and the skydivers had to remind themselves that the equipment was 100% reliable and resist the urge to pull the rip cord prematurely.

East Germany (German Democratic Republic)

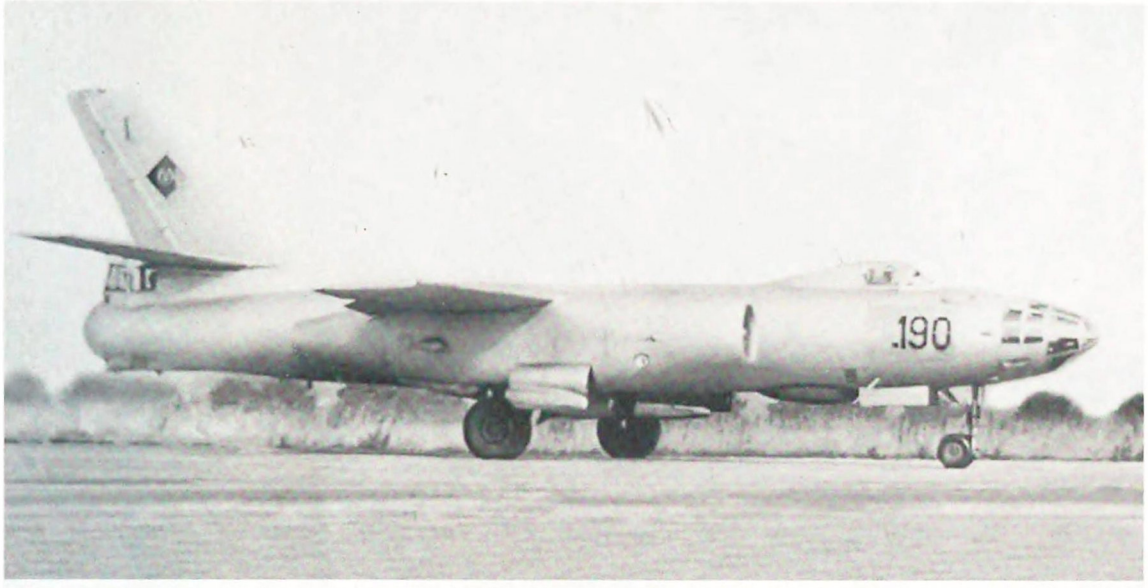
A total of ten IL-28s were delivered to East Germany, but only one of them – the sole IL-28U trainer – was used as per its primary purpose. In its early days the **East German Air Force** (EGAF) – known until 1st March 1956 as KVP-L (*Kasernierte Volkspolizei-Luft* – People's Police (Air) Quartered in Barracks, i.e. on constant duty), because the country was not yet allowed to have official armed forces – had to make do with Yakovlev Yak-18 *Max* basic trainers, Yak-11 *Moose* piston-engined advanced trainers and MiG-17 *Fresco* fighters for target-towing and threat simulation duties. Soon enough, however, the EGAF – now called LSK/LV (*Luftstreitkräfte und Luftverteidigung der Deutschen Demokratischen Republik* – Air Force and Air Defence Force of the German Democratic Republic) – required more capable hardware for training fighter pilots in aerial gunnery techniques and training anti-aircraft artillery crews. The IL-28, which had been operating from East German soil since 1955, was selected as the most suitable type; the EGAF knew its performance well, since the type had participated in Warsaw Pact joint exercises.

Hence at the orders of Willi Stoph, East Germany's then-Minister of National Defence, the 3rd *Staffel* (squadron) of JFG 1 (*Jagdfliegergeschwader* – Fighter Wing) at Cottbus was reorganised in February 1959. Its first and second flights continued to operate PZL Lim-5 day fighters and Lim-5P all-weather interceptors – Polish-built versions of the MiG-17F *Fresco-C* and MiG-17PF *Fresco-D* respectively. (Lim = *licencyjny myśliwiec* – licence-built fighter; P = [*samolot*] *przechwytujący* – interceptor.) In contrast, the third flight re-equipped with initially two IL-28s transferred from the Soviet Air Force in June 1959. To this end four LSK/LV pilots took conversion training in Cottbus from 1st February – 4th March, while two navigators and three radio operators underwent theoretical training at the Soviet Air Force's 11th ORAP stationed at the nearby Neu-Welzow AB, which also supplied the two aircraft. The bombers were suitably modified as described in Chapter 4, with a cable drum and a fabric target 'sock' in the bomb bay.

In 1960 the target-towing flight of 3/JFG 1 became an independent unit reporting directly to the 1st Air Defence Division, becoming the ZDK/1. LVD (ZDK = *Zieldarstellungskette* – target-towing flight; LVD = *Luftverteidigungsdivision*). The unit became fully operational in the spring of 1960. Shortly afterwards, however, it was transferred to the EGAF's Transport Aviation Flying School (*Transportfliegerschule*).

A single IL-28U (again a former VVS machine) was delivered in 1961 for crew training. Further deliveries of second-hand IL-28Rs from the national aircraft industry (see below) followed in November 1961, which allowed

East German Air Force IL-28 '226 Black' takes off.



'190 Black', another East German IL-28 received from the Soviet Air Force in bomber configuration.

the flight to be expanded to squadron strength and become independent once again as the ZDS 21 (*Zieldarstellungsstaffel* – target-towing squadron). The unit's home base changed several times; at one time it operated from Drewitz AB not far from Cottbus, which was also home to the EGAF's JG 7. Five more IL-28s were transferred from the 11th ORAP to ZDS 21 at this base in 1962. A curious fact is that the *Beagles*' original Soviet insignia were not painted over but 'wallpapered over' – the EGAF square insignia were applied in the form of huge decals (!), only the remaining tips of the pentastars being painted out.

ZDS 21 provided target practice primarily for National People's Army (NVA – *Nationale Volksarmee*) AA gunners firing anything from 14.5-mm (.57 calibre) heavy machine-guns to AA guns of more that 100 mm calibre. The 57-mm S-60 radar-directed automatic AA guns were noted for their high accuracy, often shooting the towed 'sock' right off. Target practice took place at the Zingst AAA range on the Baltic Sea coast.

The IL-28 target tugs were used to train East German Navy (*Volksmarine*) gunners as well; their tasks included dropping flare bombs which were used as targets by AA gunners. Such gunnery practice took place in international waters in the Baltic Sea, and the target tugs (and the *Volksmarine* ships firing on their targets) were often inspected at close range by inquisitive aircraft of the Luftwaffe and other NATO air arms. LSK/LV fighter pilots were to join the fun later on, practicing attacks on low-flying targets. The LSK/LV used the IL-28 not only for target-towing; occasionally they were used for threat simulation, making mock attacks on SAM sites and airbases to test the readiness of their air defences.

Of course great care was taken to make sure the target tugs would not be hit by friendly fire. In the case of the heaviest calibres a 'mirror arrangement' was used – the gun barrels were set to point in the opposite direction; in this case the 'hits' were registered by filming through the gunsight.

From 1972 the unit was permanently based in Peenemünde on the Baltic Sea coast, changing its number to ZDS 33. In 1977 two of the target tugs (the ones based on the IL-28Rs) redeployed to the GSVG base at Oranienburg, operating jointly with their Soviet 'colleagues' – the locally based 65th OBAE. On 1st December 1981 the squadron was 'demoted' to ZDK 33 – probably because not enough aircraft remained for a squadron, four IL-28s having been lost in accidents and a further two having been retired.

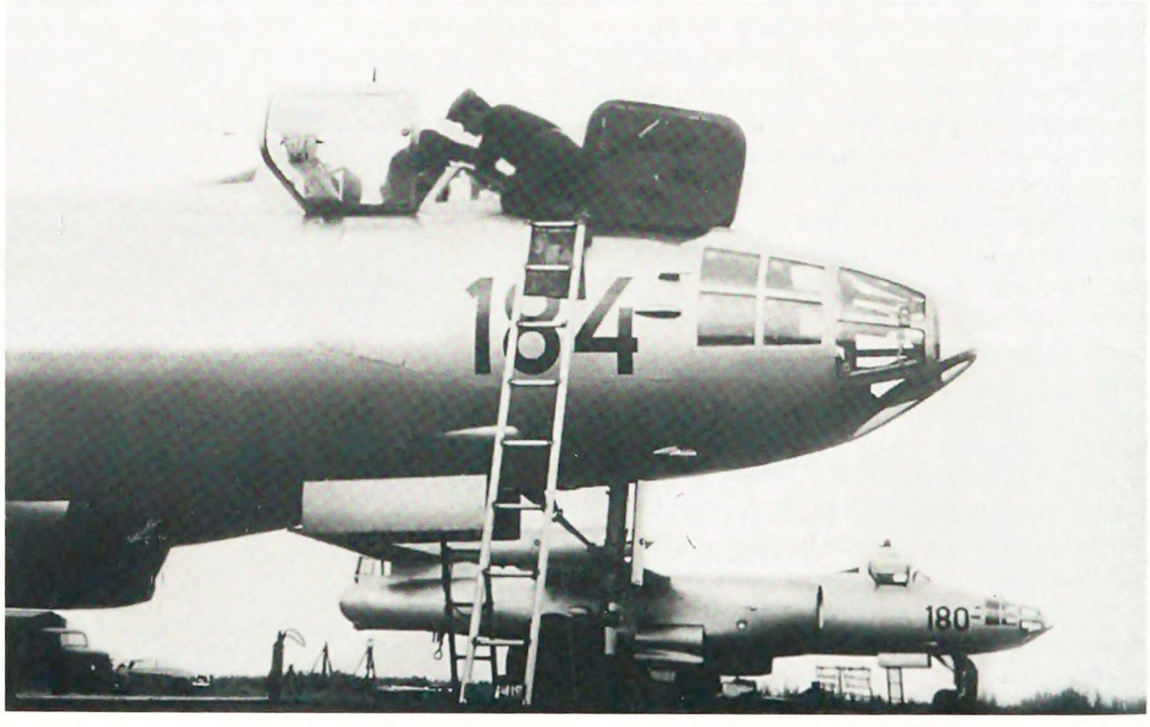
The East German IL-28s served until 1982 when they were replaced in ZDK 33 by two Czechoslovak-built Aero L-39V Albatros single-seaters (a specialised target-towing version of the L-39C advanced trainer) with Letov KT-04 towed targets. The last remaining *Beagle*,

This view of '196 Black' outfitted as a target tug shows the guide wheel for the towing cable aft of the bomb bay. Though this is clearly a publicity shot, the serial is not altered, as was often the case with EGAF aircraft; note the somewhat unusual rendering of the digit '1'.

IL-28R '184 Black' (ex-DM-ZZK) lines up for take-off; the cable guide roller can just be seen in this view

208 Black, was retired on 20th October 1982 and preserved at the LSK/LV officers' flying school in Bautzen (*Offizierhochschule 'Franz Mehring'*), which boasted a small aircraft museum – the so-called *Traditionsvorstartlinie* ('tradition flight line'). Upon retirement this aircraft gained a camouflage scheme with dark green/dark earth upper surfaces and light blue undersurfaces and, inexplicably, a red serial (in reality only single-seat fighters wore red serials in the EGAF, all other aircraft having black serials). The sole IL-28U ended up as a ground target at the Peenemünde target range, and the badly shot-up airframe was still there in 2007, painted up in mottled camouflage and with World War II style Luftwaffe crosses!

The other operator of the type in East Germany was the national **aircraft industry** – specifically, VEB Entwicklungsbau Pirna, which needed a testbed for the Pirna 014 turbojet. As recounted in Chapter 4, two IL-28Rs were obtained in 1958-59 and converted into engine testbeds by MAB Schkeuditz. The first of these, registered DM-ZZI, was diverted from an export order destined for the United Arab Republic; hence this



Here, both of the former engine testbeds – '180 Black' (ex-DM-ZZI) and '184 Black' – are parked together between missions. Note the absence of the radar which was not reinstated after conversion to target tugs.

'Only U...' Quite literally – this photo depicts the EGAF's only IL-28U trainer, '193 Black'. Here it is being refuelled by a tanker based on the East German IFA G5 army lorry with a trailer.

aircraft had a peculiarity – all maintenance stencils were in English. The other aircraft, DM-ZZK, came from Soviet Air Force stocks.

The testbeds were based at Dresden-Klotzsche airport, which was also the factory airfield of Flugzeug-Werke Dresden. Technically the tests went well – in fact, the engine performed rather better than expected. However, there were incidents of a different nature. On one occasion (28th March 1960) DM-ZZK crewed by pilot Gerhard Puhlmann, navigator/radio operator

This shot of '193 Black' taken at a different date (note the more angular style of the digit 3) shows the aircraft wearing the 'winged Q' maintenance award badge equivalent to the Soviet 'Excellent aircraft' badge, the Q standing for *Qualität*. Technicians wearing ear protection are at work on the aircraft.

The same IL-28 '196 Black' and the same tableau (three crewmen and a map), albeit in a night setting.

Helmut Krautz and test engineer Klaus-Hermann Mewes (pronounced '***Mev**es*') was due to fly a routine test mission with the Pirna 014 V20 – the first engine of the Pirna 014A-1 production version. This was scheduled to be the final test mission with this particular engine because the next test article, the Pirna 014 V22, was ready to commence flight tests on 1st April. Curiously, 28th March was a Monday and it also happened to be Mewes' 13th test mission in this particular aircraft. Two wrongs make a right, eh?

According to the flight plan the engine was to be checked for acceleration at various flight speeds at an altitude of 6,000 m (19,685 ft). At 1237 hrs local time the aircraft lifted off from runway 22 at Dresden-Klotzsche; one minute later the FOD protection shutter was opened and the engine was started at 1242 hrs. At first the Pirna 014 ran at 7,850 rpm – the so-called climb setting, delivering 3,150 kgp (6,940 lbst); together with the VK-1As this gave a total of 8,546 kgp (18,840 lbst), the aircraft climbing at 35 m/sec (6,890 ft/min)!

At 3,000 m (9,840 ft) DM-ZZI assumed a heading of 240° – one of the two headings of the envisaged racetrack course – and continued climbing, the crew donning their oxygen masks. At 6,000 m the test engine was throttled back to flight idle (6,000 rpm), delivering 900 kgp (1,985 lbst). Next, the aircraft did a U-turn onto a heading of 60°, decelerating to 400 km/h (248 mph) indicated airspeed, and the day's test work began. Mewes set the development engine to full throttle; in order not to exceed the 600-km/h (372-mph) IAS speed limit at that altitude, Puhlmann had to throttle back the main engines. At the proper time the development engine was throttled back to flight idle again and the aircraft turned onto a heading of 240° for the second test run. Here is how Mewes describes what happened next:

'Without anything untoward we passed the second measurement point. The only unusual thing was that in my headset I heard the navigator advise the pilot that three MiGs were approaching. Then, shortly before the next measurement point, came the voice of Helmut Krautz from the rear cabin: "Watch out, we've got company! The three MiGs are joining us!" Nothing of the sort had happened before; and indeed, there they were. These were Soviet [Air Force] MiG-17s: one to port, one to starboard and one directly behind us! They were flying so close that we could see the pilots' faces clearly.

Since we were flying relatively slowly in preparation for the third test run, the MiG pilots had to use their airbrakes all the time in order to maintain the same altitude as we (and the same speed – *Auth.*). *Of course, in these conditions continuing our experiments was out of the question. So we just sat back and watched our escort, assuming that the pilots probably only wished to satisfy their curiosity. After all, our three-engined IL-28 must have appeared almost unbelievable to the Soviet pilots!*

Soon enough, however, on contacting the Dresden tower we learned otherwise. While we were up here an aircraft had strayed off the international air route near Magdeburg; hence the airspace had been closed, and [Dresden ATC] had neglected to promptly call us back.

Now, our escorts were getting extremely annoyed about our constant manoeuvres at minimum speed; they were even shaking their fists at us, making "go forward" gestures time and again. Perhaps they meant that we should go a little faster. Near Freital (a township immediately south-west of Dresden – *Auth.*), *however, Gerhard extended the landing gear to show them that we intended to land at Dresden. That was probably the last straw, because one of the MiGs suddenly accelerated, overshot at high speed, passing below us, then zoomed into a brief climb, only to come down again immediately, rocking its wings and staying ahead of us. The command was unmistakeable, and we called the Dresden tower, asking what we should do in this situation. "Follow the lead aircraft, we will try to get you released!" – came the answer.*

This shot of '196 Black' (foreground) and '190 Black' is unusual in that both aircraft have the tail cannons fitted -- a rare occurrence for the East German IL-28s.

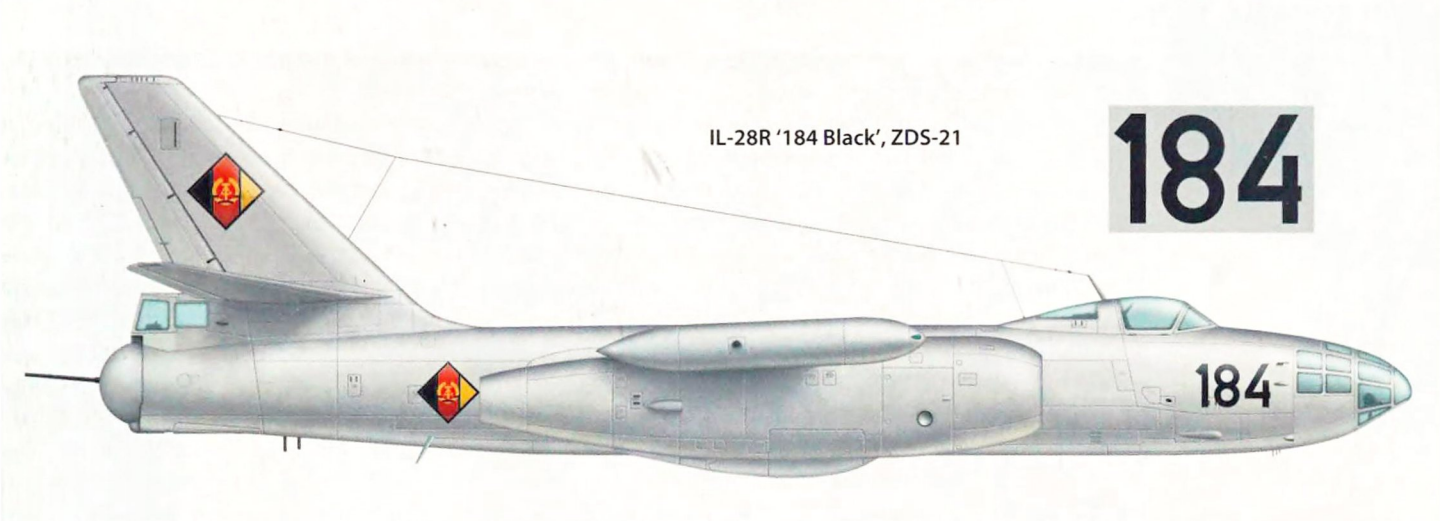
That was all very well – but where were they taking us? Puhlmann instructed the navigator to keep watch for what airfield we would be approaching, for we were now steadily descending, flying in a wide arc towards the north-north-west. We assumed it must be [the nearby] Großenhain [AB] because a Soviet unit was stationed there (the GSVG's 296th APIB (***avia*polk** *istre***bit***eley-bombardi***rov***schchikov** – Fighter-Bomber Regiment) equipped with MiG-17Fs at the time – *Auth.), and the IL-28U which our pilots used to get their type ratings was also there. The altimeter showed 2,000 m [6,560 ft]; Gerhard requested and obtained Großenhain's ground parameters (runway length, approach headings etc. – Auth.) from the Dresden tower, as we still had no radio contact with either the MiGs or the airfield. The development engine had been shut down and its protective shutter extended by the time we broke clear of the clouds and I heard Gerhard's voice: "I recognise the place, it's the approach to Großenhain! But where are our escorts?" We called Dresden tower again, and the answer got us out of this pretty complicated situation: "Abort the landing approach and return to base! Use approach Delta-North! You are free." Gerhard immediately retracted the landing gear and put the Ilyushin jet into a climb again. Suddenly Helmut's voice came through the headset: "Our escorts are back!" Sure enough, they were, but this time they were flying in formation and some way off. The pilots saluted us, the fighters rocked their wings and made off in a wide turn; we breathed a sigh of relief – the ordeal was over!"*

It should be added that DM-ZZK was then wearing a flag identical to that of West Germany – the elaborate coat of arms in the centre of the East German flag was not added until later in 1960. The MiGs, which had scrambled to intercept the wayward aircraft, were expecting to find a Western spyplane – and the 'West German' flag on the tail of the testbed certainly did not help! When the justifiably alarmed pilot called Dresden ATC, the latter promptly contacted the Soviet military authorities and straightened things out. Still, that was a hell of a nasty experience for the crew!

That was not the end of it. Because of the intercept the day's test programme had been fulfilled less than 50%. Therefore, after landing at Dresden the cine camera was reloaded, fresh chart paper was loaded into the test equipment recorders and DM-ZZI took off again at 1625 hrs to continue the test programme which had been so rudely interrupted. As it did so, a freak gust of tailwind caught it, causing the aircraft to 'fall through' and bounce twice before climbing away – just missing the localiser at the far end of runway 22! After climbing

Another view of the same night scene with IL-28s '190 Black' and '196 Black'.

224
East German Air Force IL-28 '224 Black' outfitted as a target tug, ZDS 33
224
205
IL-28 '205 Black' used as a target tug by the original ZDS; it crashed in May 1969
205
208
IL-28 '208 Black' preserved at Bautzen as '208 Red' in fictional camouflage
208
193
IL-28U '193 Black' with 'Winged Q' maintenance award badge, ZDS
193



IL-28R '184 Black', ZDS-21

to minimum safe altitude the pilot extended the landing gear and asked the navigator to examine the mainwheels, using the front view mirrors under the stabiliser tips. The navigator reported that both mainwheel tyres had a broad white stripe down the middle. Fearing that the tyres were damaged and might explode at high altitude, the crew chose to terminate the assignment; a landing with burst tyres was the last thing they wanted on that particular day! It was just as well that they did: the tyres were indeed ruined and needed replacement; it was especially bad on the starboard mainwheel, where 18 layers of the 21-ply

'190 Black', probably the longest-serving EGAF IL-28 target tug, is caught by the camera a few moments after take-off with the landing gear just beginning to retract.

The East German IL-28s

Serial/registration	Version	C/n	Notes
180 Black	IL-28R	41418	Ex-DM-ZZI, transferred 1-11-1961. WFU Oranienburg AB 1976; SOC 25-6-1979, scrapped
184 Black	IL-28R	5901207	Ex-DM-ZZK, transferred 1-11-1961. WFU Oranienburg AB 1977; SOC 25-6-1979, scrapped
190 Black	IL-28	55006937	Moscow-built. Ex-Soviet Air Force, TOC ?-1959, ZDK/1. LVD, in 1960 to ZDK/TFSchule, later ZDS, ZDS-21, ZDS-33 and ZDK-33. SOC 12-10-1982, scrapped
193 Black	IL-28U	610311	Full c/n 65010311; was reported in error as 0311. SOC 30-3-1979, became a target at the Peenemünde target range
196 Black	IL-28	55006944	Moscow-built. Ex-Soviet Air Force/11th ORAP, TOC ?-1959, ZDK/1. LVD, in 1960 to ZDK/TFSchule, later ZDS and ZDS-21. Crashed (date unknown), SOC 30-7-1971
204 Black	IL-28	4404426	Voronezh-built. Ex-Soviet Air Force, TOC 12-1-1962, ZDS. Crashed in Poland 12-1-0-1963
205 Black	IL-28	54006279	Moscow-built. Ex-Soviet Air Force, TOC ?-1962, ZDS. Crashed ?-5-1969, SOC 30-5-1970
208 Black	IL-28	55006448	Moscow-built. Ex-Soviet Air Force, TOC ?-1962, ZDS, later ZDS-21, ZDS-33 and ZDK-33. SOC 13-10-82, preserved Bautzen base museum this date; later to Museum Appen, then to *Luftwaffenmuseum Berlin-Gatow*, displayed in camouflage colours as '208 Red'
224 Black	IL-28	55006445	Moscow-built. Ex-Soviet Air Force, TOC ?-1962, ZDS, later ZDS-21 and ZDS-33. SOC 9-12-1977, scrapped
226 Black	IL-28	55006417	Moscow-built. Ex-Soviet Air Force, TOC ?-1962, ZDS, later ZDS-21. Crashed Peenemünde AB 4-2-1970, SOC 30-7-1971
DM-ZZI	IL-28R	41418	Irkutsk-built. Engine testbed, VEB Entwicklungsbau Pirna. To EGAF 1-11-1961 as 180 Black
DM-ZZK	IL-28R	5901207	Ex-Soviet Air Force, TOC ?-1959. Engine testbed, VEB Entwicklungsbau Pirna. To EGAF 1-11-1961 as 184 Black

tread had been worn right through! The tyre damage was so severe that the aircraft vibrated and swerved during the landing run. The day's programme had gone down the drain. Moral: two wrongs don't make a right.

East German IL-28s were also used to test new models of parachutes. Before a test jumper could risk his life a tin dummy filled with sand would be dropped from an IL-28 at various speeds and altitudes.

Egypt (United Arab Republic; Arab Republic of Egypt)

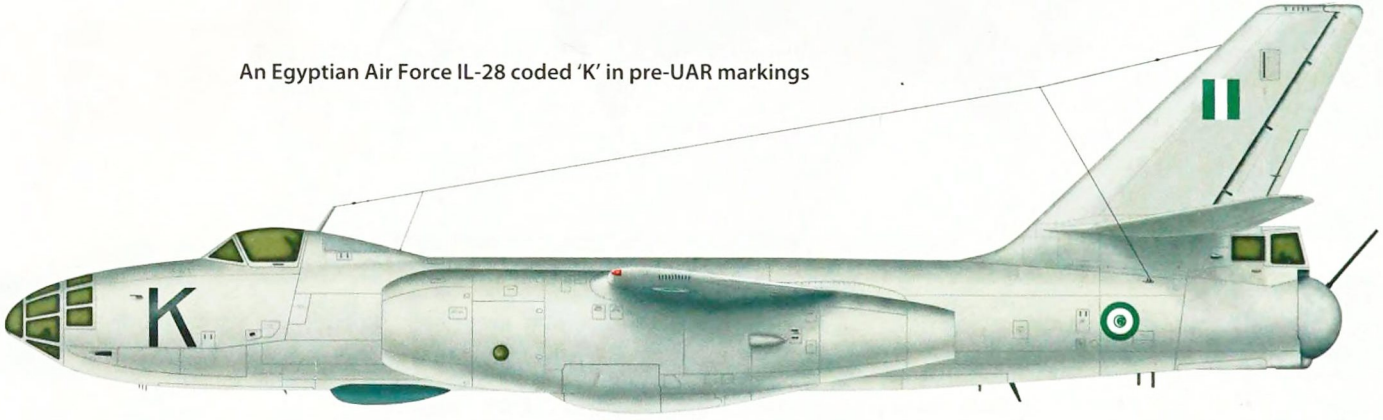
The **Egyptian Air Force** (EAF, or *al Quwwat al-Jawwiya il-Misriya*) ordered about 50 IL-28 bombers and IL-28U trainers, taking delivery of the first aircraft in December 1955; according to some reports, 30 were delivered by the year's end. The aircraft were delivered via Czechoslovakia where the training of the Egyptian crews took place.

Three squadrons of *Beagles* were formed (Nos. 8, 9 and 28 which came under the control of Air Brigade 61 at Abu Suweir), albeit only one of them was operational in October 1956; the aircraft were initially based at Cairo-West AB. After the Suez Crisis of 1956, in which at least seven of the bombers were lost to Israeli air strikes, President Gamal Abdel Nasser launched a major programme to re-equip his armed forces; this included the acquisition of more IL-28s. In March 1957 three Romanian merchant ships brought the first ten *Beagles* to Alexandria; by late June the EAF had about 40 of the bombers on strength.

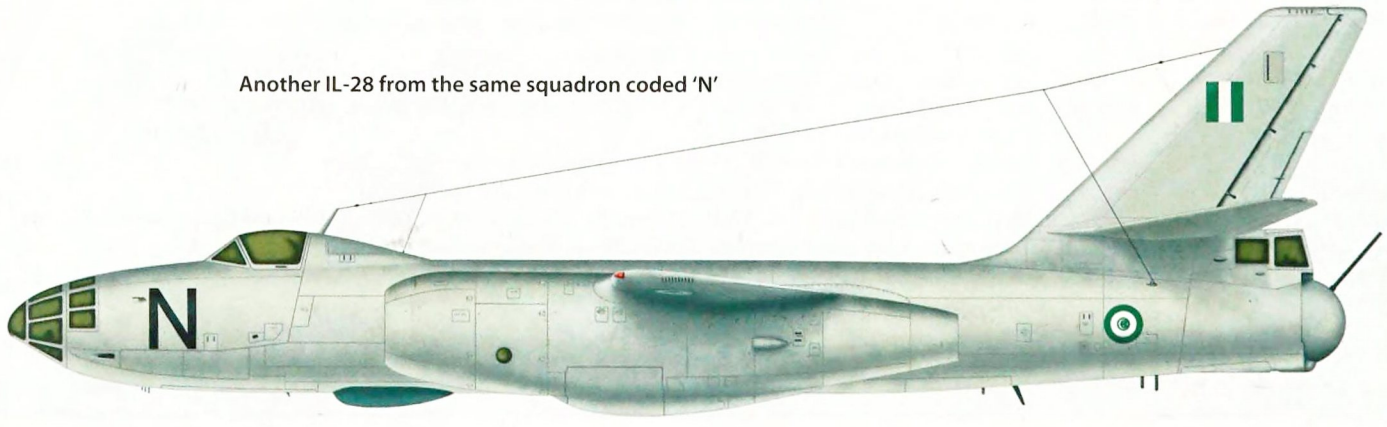
In his speech on 25th (some sources say 23rd) July 1957 on the occasion of Nasser's fifth anniversary as President, Egyptian Air Force Chief of Staff Air Vice-Marshal Mohammed Sidqi stated that the EAF's first-line assets had doubled as compared to the time immediately before the Suez Crisis. To add weight to his words, a formation of no fewer that 100 combat jets was to pass over Cairo on the same day. However, the show of force fizzled because the tech staff had managed to prepare only 42 aircraft for the display – eleven MiG-15*bis*, eighteen MiG-17Fs and thirteen IL-28s. The spectators went wild all the same, but the message was clear: it would take the EAF years to become fully combat-capable. More IL-28s put on a similar show on 19th December 1957, flying low over Cairo to celebrate the EAF's 25th birthday.

When Egypt and Syria joined forces against Israel, creating the United Arab Republic on 1st February 1958, the EAF IL-28s were included into the assets of the newly-created **United Arab Republic Air Force** (UARAF). In addition to the basic bomber and trainer versions, the UARAF reportedly operated IL-28R tactical photo reconnaissance aircraft and Chinese-built Harbin B-5 copies of the *Beagle*. Egypt reclaimed most of these aircraft in September 1961 after the dissolution of the UAR, when Egypt and Syria (and their respective air

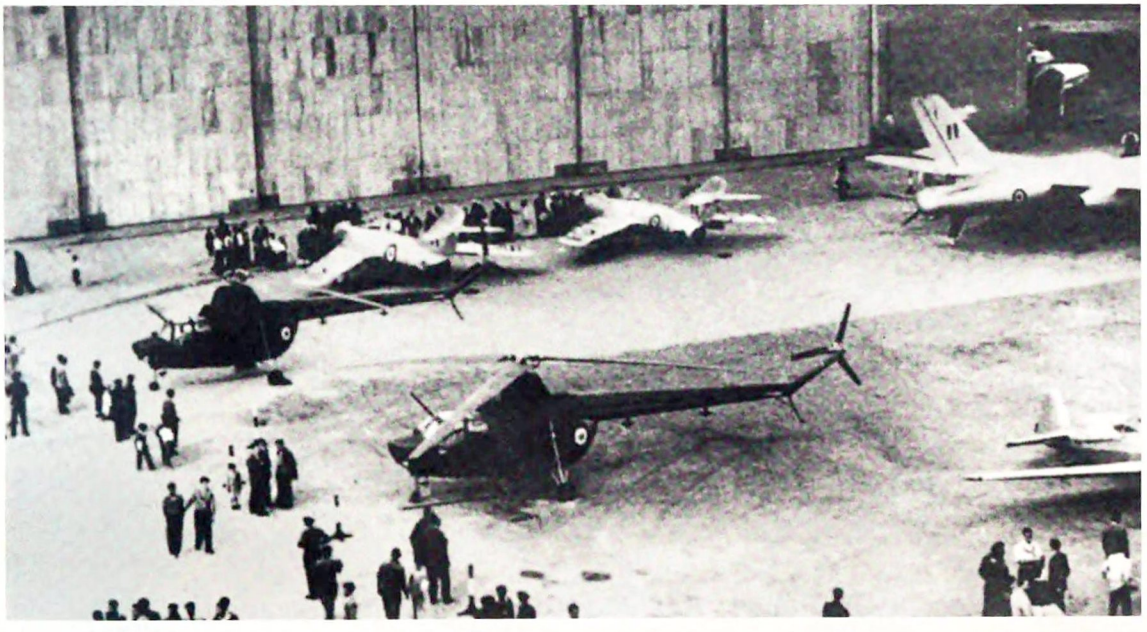
An Egyptian Air Force IL-28 coded 'K' in pre-UAR markings



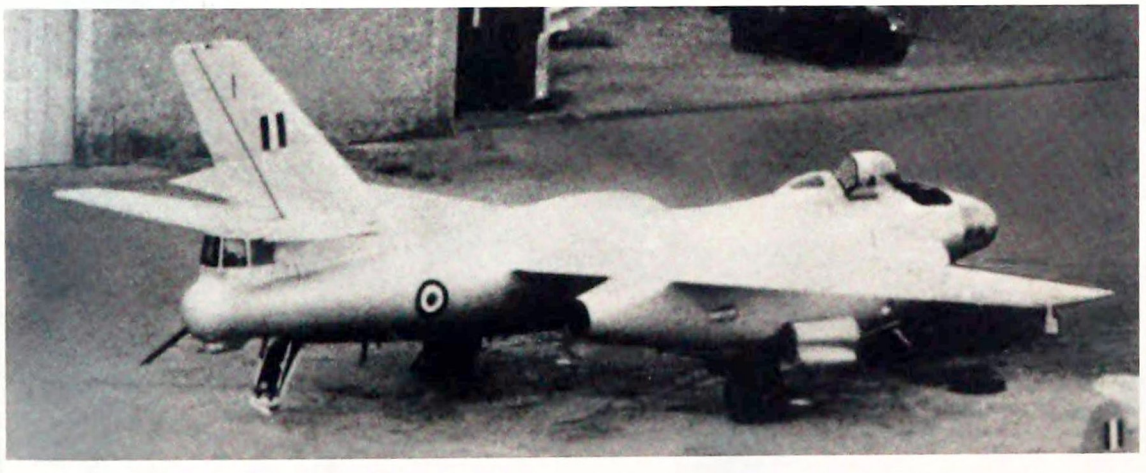
Another IL-28 from the same squadron coded 'N'



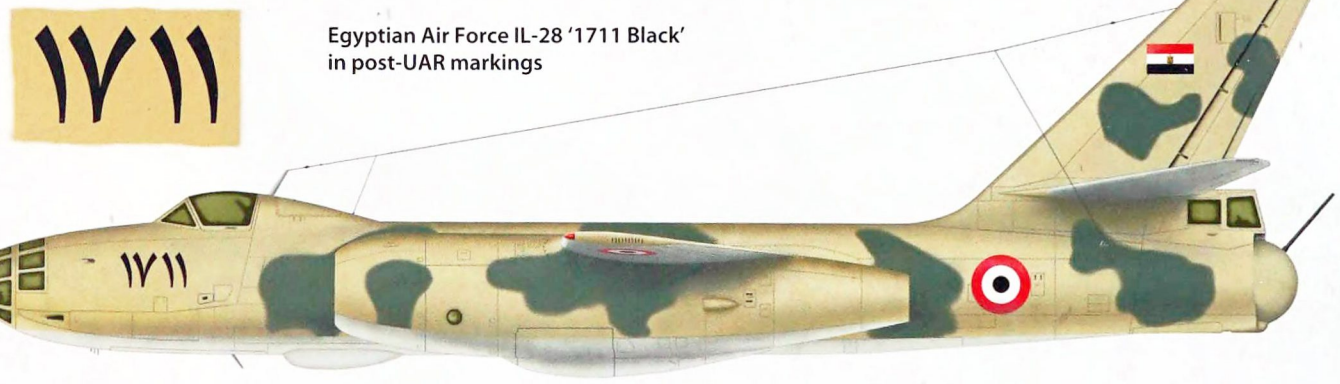
Egyptian IL-28 crews lined up for a parade, with their mounts in the background. The letter codes include P, U, L, R, N, S, J and A.



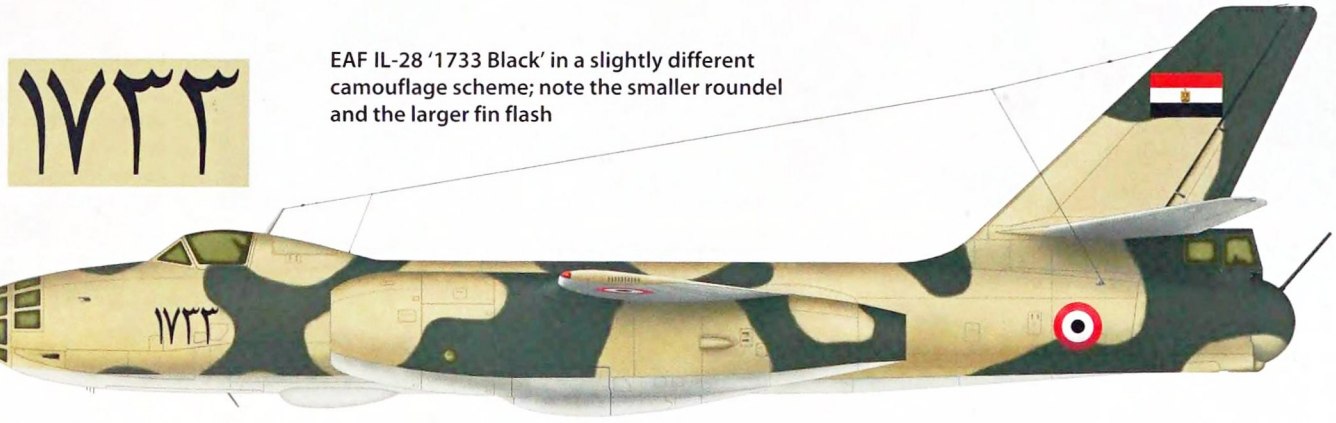
An Egyptian IL-28 in natural metal finish and pre-UAR markings as part of an aircraft display at Cairo-Almaza AB staged in 1957 to mark the EAF's 25th birthday. Also featured are two MiG-15s, two Mi-1 helicopters and a Zlin Z-26 Trener basic trainer.



A closer look at the same IL-28. The navigator's hatch cover appears to be missing.



Egyptian Air Force IL-28 '1711 Black' in post-UAR markings



EAF IL-28 '1733 Black' in a slightly different camouflage scheme; note the smaller roundel and the larger fin flash

Egyptian Air Force IL-28U '1801 Black' in post-UAR markings

forces) became independent once again. (It should be noted that the designation UARAF remained in use with regard to the Egyptian air arm until 1972.)

Reports on the total number of Egyptian IL-28s vary widely, some sources stating as many as 72 aircraft in 1966. These included four second-hand IL-28T torpedo-bombers bought from the Soviet Navy in 1962 with a supply of 90 RAT-52 torpedoes. Other sources claim that 27 of 30 (!?) aircraft on strength in 1967 were destroyed on the ground by Israeli air strikes during the Six-Day War (5th-11th June 1967). Considering that two IL-28s were resold to Nigeria and six to Syria, it makes you wonder what happened to the remaining 34 aircraft! However, it should be remembered that, as already mentioned, Algeria donated 12 IL-28s to Egypt in late July 1967.

This EAF IL-28 (1774 Black) has a camouflage scheme of sand and two shades of green.

Left: Camouflage was quickly introduced in the EAF after the Six-Day War. Here, pristine-looking Egyptian IL-28 '1733 Black' sits in a concrete-lined revetment.

Below: The sand base colour prevails on this IL-28U trainer serialled '1801 Black'.

Known Egyptian (EAF and UARAF) IL-28s			
Serial	**Version**	**C/n**	**Notes**
A	IL-28U	?	Natural metal finish, UARAF insignia
C1	IL-28	?	Natural metal finish, UARAF insignia
E	IL-28	?	Natural metal finish, UARAF insignia
F	IL-28	?	Natural metal finish, UARAF insignia
G	IL-28R	?	No.28 Sqn. Natural metal finish, UARAF insignia
G1	IL-28	?	Natural metal finish, UARAF insignia
H	IL-28	?	Natural metal finish, UARAF insignia
K	IL-28	?	Natural metal finish, pre-UAR insignia, seen 1956
L	IL-28	?	Natural metal finish, UARAF insignia
M	IL-28	?	Natural metal finish, UARAF insignia
N	IL-28	?	Natural metal finish, UARAF insignia
O	IL-28	?	Natural metal finish, UARAF insignia
O1	IL-28	?	Natural metal finish, UARAF insignia
P	IL-28	?	Natural metal finish, UARAF insignia. Possibly to Nigeria in 1968
Q	IL-28	?	Natural metal finish, UARAF insignia
R	IL-28	?	Natural metal finish, UARAF insignia
S	IL-28	?	Natural metal finish, UARAF insignia
T	IL-28	?	Natural metal finish, UARAF insignia
U	IL-28	?	Natural metal finish, UARAF insignia
V1	IL-28	?	No.8 Sqn. Natural metal finish, UARAF insignia
V2	IL-28	?	Natural metal finish, UARAF insignia
1711 Black	IL-28	?	Sand/brown camouflage
1714 Black	IL-28	?	Natural metal finish
1731	IL-28	?	Natural metal finish
1733 Black	IL-28	?	Sand/brown camouflage
1760	IL-28	?	
1772	IL-28	?	Preserved Cairo-West AB
1773	IL-28	?	Reportedly used ATC call-sign SU-BAB
1774 Black	IL-28R	?	Sand/green/dark green camouflage
1778	IL-28	?	Sand/brown camouflage
1801 Black	IL-28	?	Natural metal finish, later sand/brown camouflage

Anyway, during the inter-war period (1969-72) the UARAF order of battle included three *Beagle* squadrons. Two of these – Nos. 8 and 9 Sqns – were based at Cairo-West AB and equipped with the bomber version, coming under the control of the co-located Air Brigade 407 (they were subsequently renamed Nos. 75 and 76 Sqns respectively). The third, No.20 Sqn, was part of Air Brigade 533 headquartered at Inchas but was nevertheless also based at Cairo-West; it was a reconnaissance unit flying IL-28Rs. (Actually, the term 'inter-war period' is not quite appropriate because the War of Attrition was on in 1968-70.)

By the outbreak of the Yom Kippur War (6th October 1973) Egypt had 35-40 IL-28s in four bomber squadrons, as well as one reconnaissance squadron equipped with IL-28Rs. The *Beagles* were now based at Aswan. When the Israeli Defence Force/Air Force fielded the Dassault Mirage IIICJ supersonic fighter, this rendered the Egyptian IL-28s obsolete. Two aircraft were written off on 25th April 1970 under unknown circumstances (possibly in a collision). No more than four or five IL-28s remained airworthy by 1983.

In the early days the EAF's IL-28s had a natural metal finish and wore alphabetic or alphanumeric serials, which were later replaced by four-digit serials in Arabic characters. As a result of lessons learned in the Six-Day War, the surviving (and subsequently delivered) *Beagles* gained camouflage schemes. Speaking of which, Egypt was one of the few air arms to have camouflaged IL-28s.

Finland

In the mid-1950s the **Finnish Air Force** (*Suomen Ilmavoimat*) had a requirement for renewing its fleet of photo reconnaissance aircraft and target-towing aircraft. The five Bristol Blenheim Mk I bombers converted to target tugs in 1954-55 were retired in 1958, and the two second-hand SAAB 17A bombers bought and converted to bridge the gap were not enough. It was the same story with PHOTINT/photo mapping aircraft: the modified Douglas DC-2s were retired in 1956, followed by the Blenheim Mk Is/Mk IVs in 1958, leaving only two Hunting Percival Pembroke Mk 53 light transports to do the job. The piston-engined Pembroke was capable only of medium-altitude reconnaissance.

Finland was on friendly terms with the Soviet Union, buying military hardware from it alongside western types. The twinjet IL-28 was considered the best type to fill both roles. By then it was out of production, so an agreement was reached that an initial two *Beagles* would be transferred from Soviet Air Force stocks, with the proviso that they would be refurbished prior to delivery.

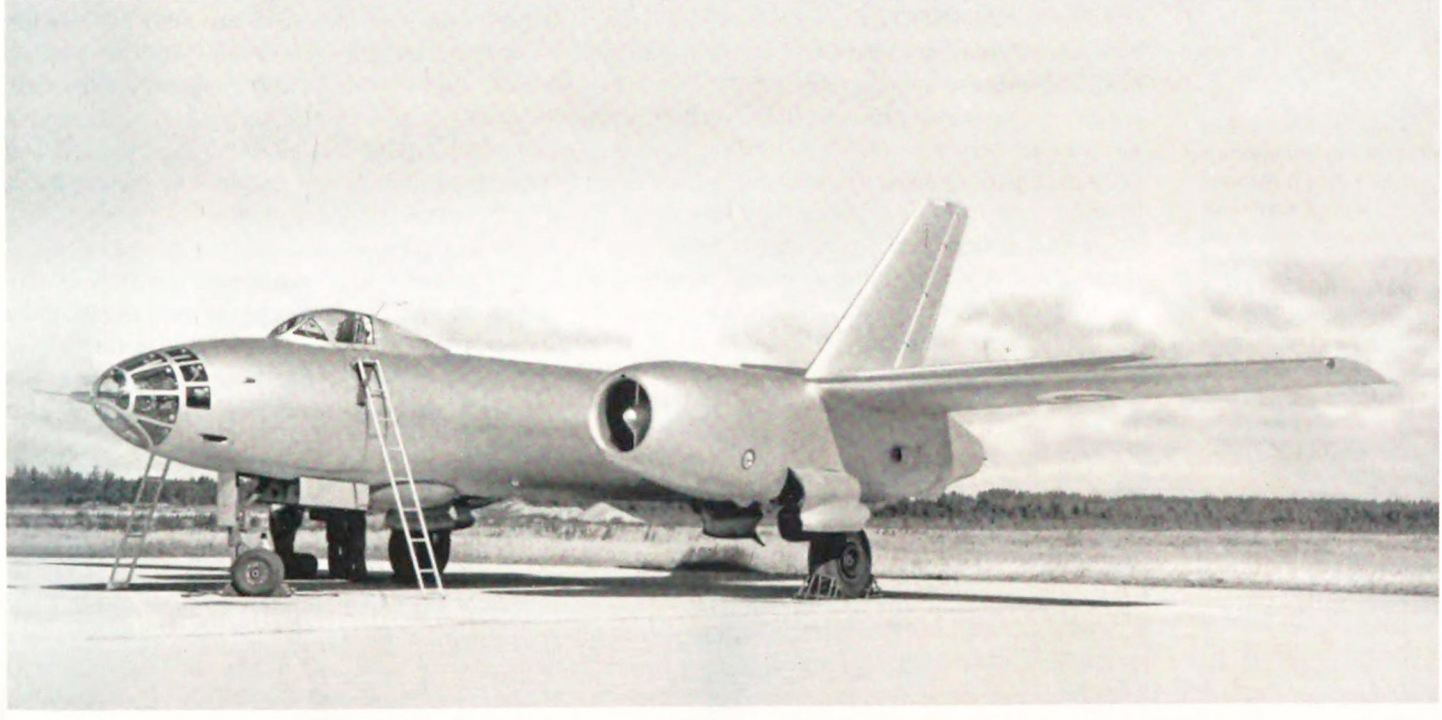
In January 1960 the *Ilmavoimat* received a Moscow-built IL-28 *sans suffixe* bomber, followed by an IL-28R reconnaissance aircraft – the first of an eventual three – in June 1961. They entered service with the Finnish Air Force's transport flight (*Kuljetuslentue*) at Utti established in 1958 as a part of the Karelian Air Wing (*Karjalan Lennosto*). This is not as strange as it may seem, considering that the unit had been tasked with photo reconnaissance and target-towing duties from the outset. On 1st September 1960 it was expanded into a transport squadron (*Kuljetuslaivue*, or KuljLv); on 1st October 1965 it became a direct reporting unit, changing its name to *Kuljetuslentolaivue* (KuljLLv).

The aircrews (a 14-man group) took their initial conversion training in the Soviet Union (at TVVAUL) in June 1960, followed by further training at Utti. This was the first time Finnish airmen had trained in the Soviet Union after the Second World War, and their flying skills were high enough for the training programme to be shortened from the planned two months to just one month. In contrast, the ground personnel were trained *in situ* by a four-man team of Soviet instructors in January-March 1960, using the first IL-28 delivered as a teaching aid. These had to use an interpreter, since neither the instructors spoke Finnish nor the trainees spoke Russian. Later, from March 1961 onwards, IL-28 navigators were also trained in Finland.

The first operational flight by an IL-28 from Finnish soil took place on 13th July 1960. The aircraft was flown by pilot Lt. Jouko Lönnberg, navigator Lt. (SG) Kari Hämäläinen and GRO MSgt Martti Laine. Two more ex-Soviet Air Force IL-28Rs were purchased in 1965 and delivered in January 1966.

A peculiarity of the Finnish Air Force's serial system was that each aircraft type was assigned sequential alphanumeric serials, the two-letter prefix having some significance. Usually it was a reference to the aircraft type, though not necessarily so (for example, during the Winter War of 1939-40 captured Soviet fighters pressed into *Ilmavoimat* service had serials prefixed VH for *vihollisen hävittäjä* – 'enemy fighter', regardless of type). The IL-28s were serialled in the NH block standing for *Neuvostoliittolainen hinauskone* (Soviet tow plane). Since these letters, by curious coincidence, were the same as the initials of the Soviet leader ('Nikita Hrushtshov' in the Finnish spelling!), the IL-28s were dubbed 'Nikita'; this was subsequently shortened to 'Nikke'.

The existing hangars at Utti were too small for the IL-28s, which created a bit of a maintenance problem. If the No.3 hangar was used for heavy maintenance the aircraft was partially pushed into the hangar with the tail sticking outside because the hangar doors were too low. Another hangar (normally used by the resident Helicopter Battalion) was only wide enough for the IL-28 to go in if the tip tanks were detached. Most often, however, the *Beagles* were serviced in the open where they were parked.



IL-28 NH-1 seen at Utti immediately after delivery, with the serial on the rear fuselage only.

Open-air maintenance work in progress on a Finnish IL-28R (NH-4) at Utti in the winter.

Another peculiarity of the early IL-28 operations was that Utti had only a gravel runway. The *Beagles* took it in good stride, but every single take-off created an almighty dust cloud. Not until August 1973 was a paved runway finally commissioned at Utti.

Speaking of which, on 18th April 1973, when the concrete runway was under construction, IL-28R NH-4 was being ferried back to Utti from the Soviet Union after an overhaul. Despite being instructed by the tower to use the unpaved auxiliary runway and acknowledging this, to everyone's dismay the Soviet pilot landed on the main runway, sending the construction workers running for their lives and miraculously missing the vehicles on the construction site. (Perhaps this was a case of mental inertia – 'acting on autopilot', you know.) Moreover, on the way to the hardstand he taxied through 1.5 m (5 ft) deep snow, the engines eating snow and blowing steam; yet the aircraft and the pilot were none the worse for wear. When the Finns later gingerly asked him how the landing went, he nonchalantly answered: *'Nor**mal'**no'* (normally).

The IL-28s were quickly converted to target tugs – mostly according to the Soviet standard. Target towing missions for various branches of the military began in 1961; apart from Utti, such sorties were flown from Helsinki, Turku, Pori and Oulu.

The target tugs differed in the type of towing equipment. NH-1 could only tow a conventional sleeve-type target that had to be jettisoned, complete with the towing cable, before landing. The other three aircraft were fitted with a BLM-1000M electric towing winch that allowed the cable to be rewound, featuring an external conduit for the cable under the rear fuselage, and worked with various types of targets. These included a conventional 'sock' 4.5 m (14 ft 9$^{11}/_{64}$ in) long with integrated metal wires to increase the RCS, which was manufactured in West Germany and carried externally rather than in the bomb bay prior to deployment; the latter took place at speeds below 150 km/h (93 mph) because at higher speeds the sleeve could get torn by the slipstream or the cable could snap. Rigid targets included the large 77BM-2 dart-shaped glider (ten of which had been supplied by the Soviet Union), which proved unsatisfactory; the small but similarly shaped SAAB-Bülow PM-5, which became the standard type in Finnish Air Force service from 1972 onwards; and the indigenous ASKM target looking like a red cigar with three large swept fins at the rear, which also turned out to be a lemon.

Starting in 1966, the Soviet and German sleeve-type targets were used in conjunction with the Swedish SAAB BT 13 hit detection system based on acoustic sensors. The PM-5 targets were equipped with the later SAAB BT 23 system; the early version featured a nose-mounted BT 23 KG transmitter and two separate microphones, which were replaced by the combined BT 23 KG 10 unit in the late version.

Photo reconnaissance missions started in 1962 – initially on a small scale; actually the first of these were concerned with photo mapping in the interests of the Topography Department and the Land Survey Administration of Finland, not reconnaissance. The older Pembrokes flew their photo mapping missions at 4,600 m (15,090 ft), furnishing images suitable for maps of no more than 1:30,000 scale. Therefore, as mentioned in Chapter 4, when high-resolution photo film became available in Finland, in the winter of 1960 IL-28 NH-1 was converted for high-altitude photo mapping by Valmet to feature a Zeiss Pleogon RMKA 15/23 camera (later replaced by a Wild camera). The Finnish Air Force resorted to such a conversion because no IL-28R was available yet. The aircraft made its first post-conversion

flight on 11th January 1961 and became operational in the photo mapping role in the spring of 1962.

Due to prevalent weather/lighting conditions the photo survey season lasted from mid-May to the end of August. Sorties were commonly flown from Oulunsalo and Rovaniemi in northern Finland; in good weather up to three photo mapping sorties, typically lasting up to three hours, were flown daily. Together, the IL-28s helped complete the national topographic project by 1975, furnishing detailed photo maps of the whole of Finland.

The arrival of the second pair of *Beagles* allowed the KuljLLv to step up its reconnaissance sorties, including overwater sorties. For example, the IL-28s were used actively during the Soviet invasion of Czechoslovakia in August 1968, when there was a sharp increase of shipping activity in the Gulf of Finland and the Baltic Sea that was probably associated with these events. In the 1970s the unit maintained 24/7 photo reconnaissance readiness, with the crews living at the base and the aircraft on quick-reaction alert duty being able to take off within three minutes after the order to scramble. In 1975 alone, 177 surveillance sorties were flown. In addition to regular bases, the IL-28Rs occasionally operated from straight stretches of motorway, including the Joutsa Highway Strip, during exercises in the 1970s.

(It is worth noting that, in the early 1970s the four aircraft were assigned full time to specific roles. NH-1 was used for photo mapping and training missions; NH-2 was the principal target tug, while NH-3 and NH-4 were reserved for reconnaissance/sea area surveillance alert duty.)

All four *Beagles* were supplied with PSBN-M radars, which proved very useful in the reconnaissance role (not to mention navigation); detecting ships on the radarscope through overcast, the crew would descend below the clouds, home in on the target, identify it and make a photo run. Actually the radars were not installed for several years because the Finns did not know how to use them; they were in storage at Rissala AB near Kuopio where they were studied and tested. The reason was that no manuals for the PSBN-M had been supplied with the aircraft; however, the Finns obtained a manual for the Western Electric AN/APQ-13 'Mickey' X-band (centimetre-waveband) bomb-aiming/navigation radar fitted to the Boeing B-29 Superfortress, which proved to be a big help because many design features were similar. A test rig for the radar was built at Utti, where the personnel were trained to work with the radar in 1966-67; finally, in 1967 the radars on all four aircraft were made operational.

The IL-28Rs of the *Ilmavoimat* had non-standard camera installations as well but these were different from that of NH-1. In addition to the standard Soviet AFA-33, AFA-42/75, AFA-42/100 and NAFA-MK, the aforementioned Zeiss Pleogon RMKA 15/23 and other western cameras were used – namely the West German Rb 20/30, the American Fairchild FRD-K 38 and the British Vinten G 95 Mk 2. The latter model was sourced from the Finnish Air Force's de Havilland Vampire FB.52s and Folland Gnat FR.1s and was used for low-level photo reconnaissance in the early 1970s.

Another unique feature of the Finnish IL-28Rs was the use of indigenous air sampling pods for radiation reconnaissance in the wake of nuclear tests and for air pollution monitoring. As already mentioned, the pods were arranged in pairs under the wing roots.

The Finnish IL-28Rs were used a lot for snooping around the Soviet border (as mentioned earlier, Finland was on friendly terms with the Soviet Union, but that did not stop the Finns from spying!). The neighbour's *Beagles* were a constant source of annoyance for the Soviet Air Defence Force (PVO – ***Pro****tivovoz****dooshn****aya*

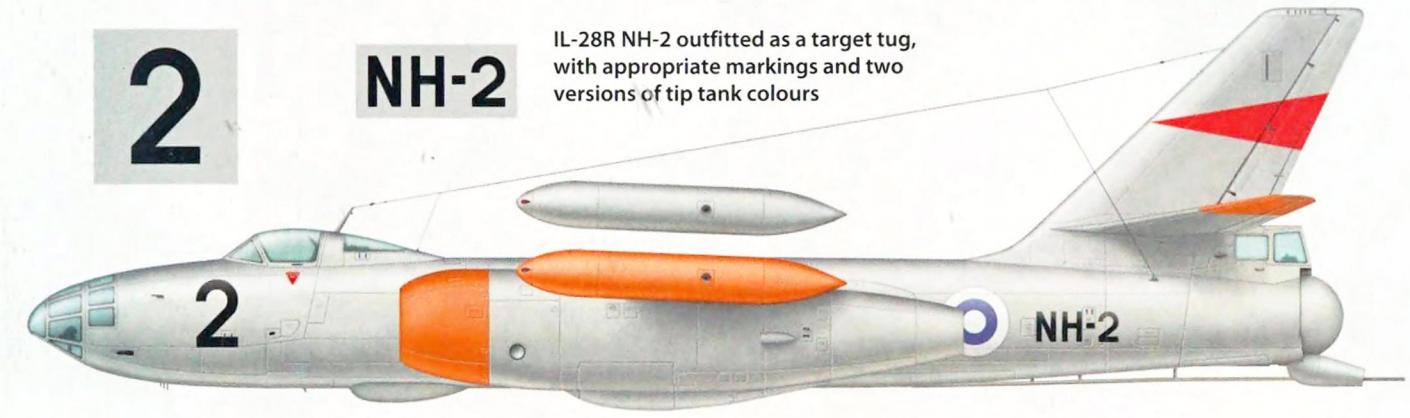
IL-28R NH-3 at Oulu in the summer of 1969. The forward cowling rings and the wingtips (including tip tanks) are painted Day-Glo orange, and a red pennant on the tail identifies the aircraft as a target tug. The nose number is still in a two-digit format as 03 (it was later shortened to 3).

Finnish Air Force IL-28 NH-1 as it looked in 1962-69

*obo**ro**na*) fighter regiments stationed in the area. As soon as the air defence radars detected an aircraft heading towards the border from Finland, fighters would scramble to intercept. Realising they had been detected, the Finnish crew would fly along the border on their side, while the Soviet fighters would do the same on their side, firmly indicating 'keep your pooch off our lawn'. Then the IL-28 would ostensibly give it up, heading into Finnish territory; as soon as the fighters, too, headed back to base, the spyplane would pop back

NH-1 sported blue forward cowling rings throughout the 1960s.

Sporting the nose number 4 and no target tug markings, IL-28R NH-4 sits parked at Kuopio-Rissala AB, with a Finnish Air Force MiG-21F-13 of the resident HävLLv 31 (31st Fighter Wing) taxying in the background.



IL-28R NH-2 outfitted as a target tug, with appropriate markings and two versions of tip tank colours

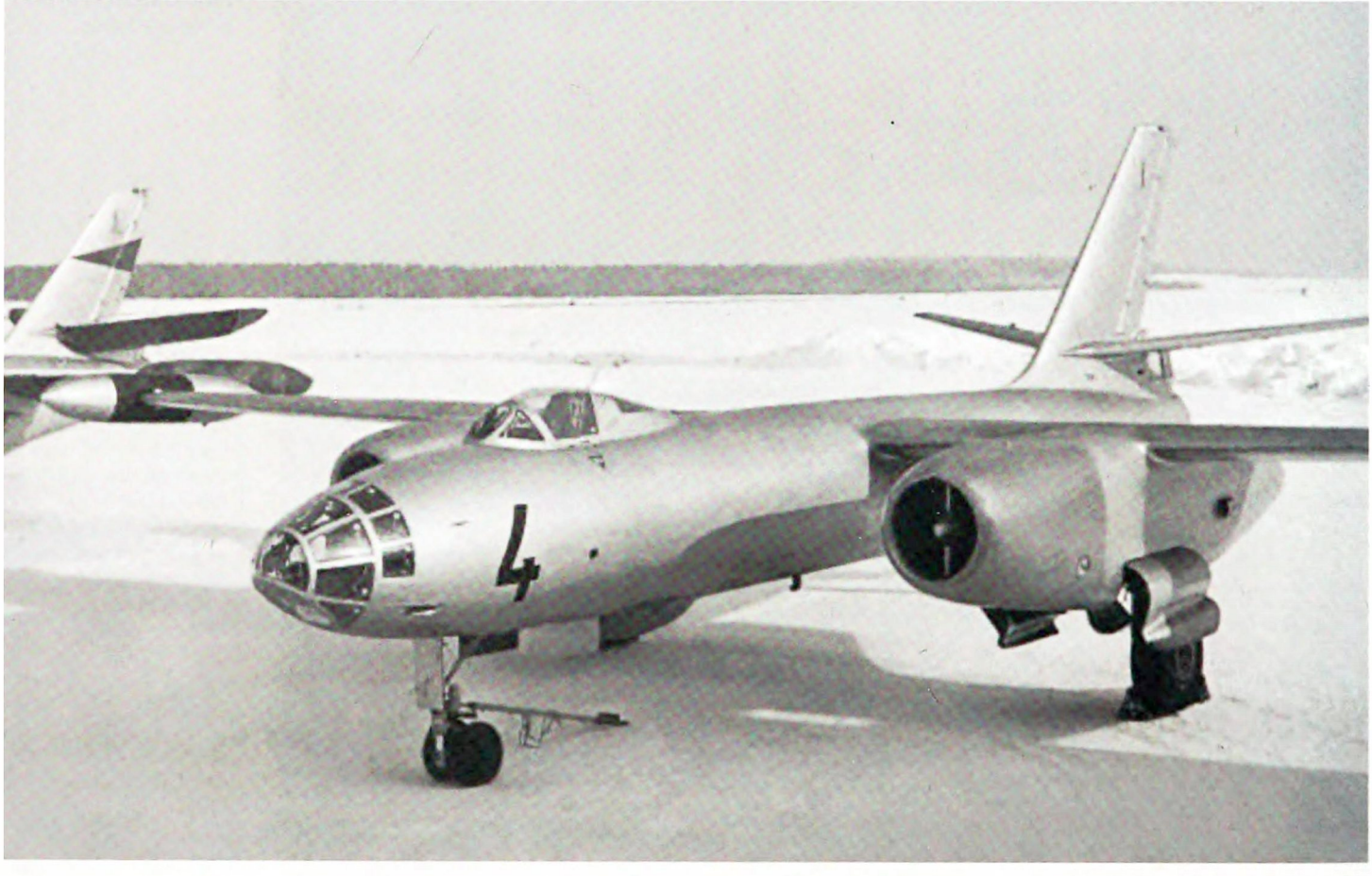
up. By then the fighters would be getting critically low on fuel and had no choice but to head for home, the angry pilots radioing to base to urgently send a 'relief crew'. The IL-28R's long endurance (thanks to its tip tanks) allowed the Finns to play this game of tag.

Starting in 1967, the Finnish IL-28 crews practices air-to-surface gunnery, using both the nose cannon(s) and the tail cannons. The first such exercise was on 15th September 1967 at the coastal artillery target range south of Kotka. During one such live gunnery practice session in August 1975 one particularly persistent IL-28 crew succeeded in sinking the target – a raft towed by a Finnish Navy ship.

In the course of their service the Finnish IL-28s were retrofitted with western avionics supplanting some of the Soviet ones. Thus, the RSB-5 (R-805) HF communications radio and the RSIU-3M (R-800) VHF command radio were replaced by two British-made Standard Radio STR9Z/100 44-channel VHF transceivers as fitted to the Finnish Air Force's Fouga CM.170 Magister jet

NH-2 takes off at Oulunsalo with a 77BM-2M target in tow in the late 1960s.

NH-2


4

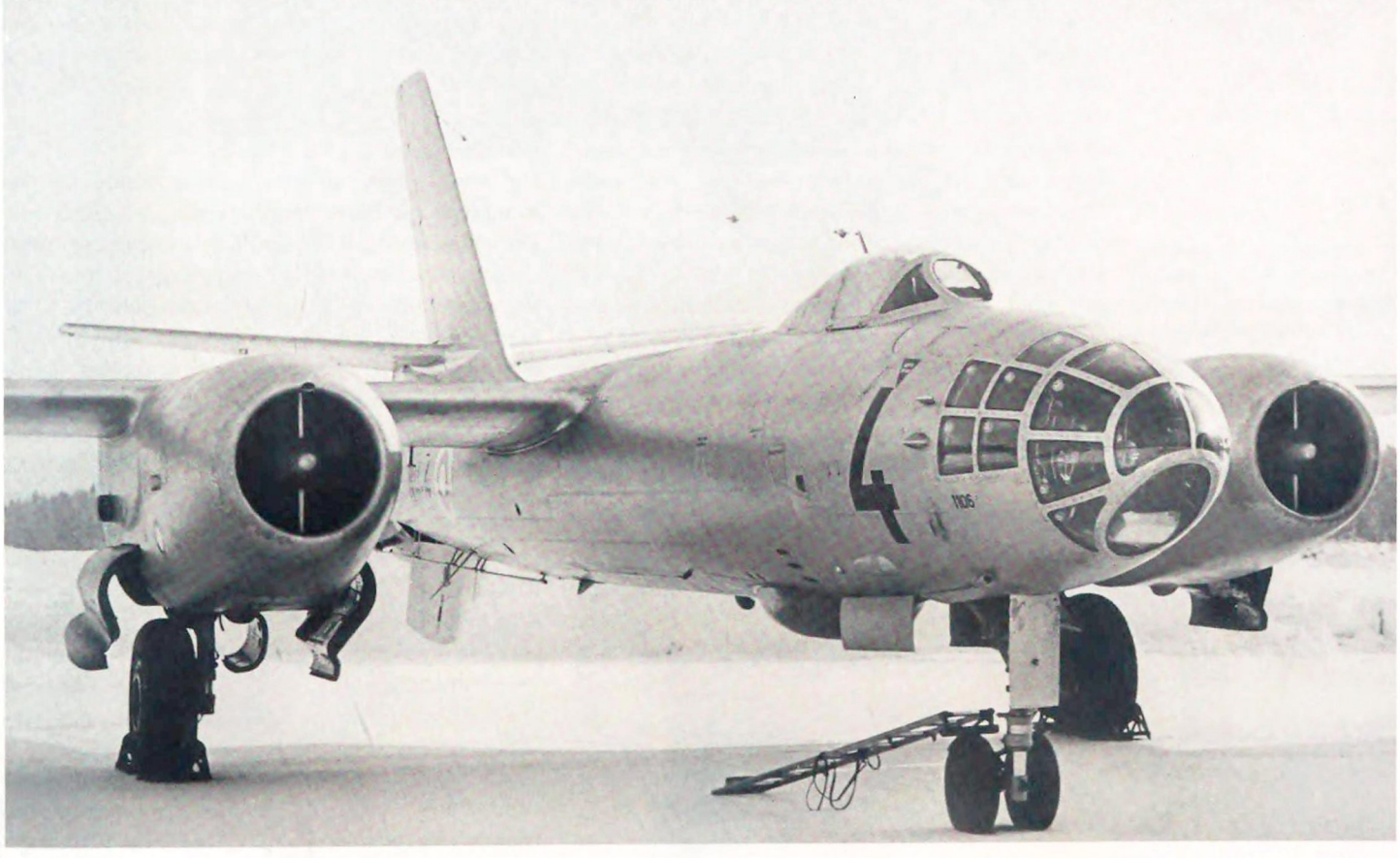
Opposite page, top: IL-28R NH-2 on a snowbound flight line at Utti with camouflaged covers on the nose glazing, cockpit, wings (including tip tanks) and tailplanes. The target towing device under the turret is clearly visible.

Left: NH-4 is depicted during a low-level pass.

trainers. Other non-standard items were of US origin – the Bendix/King RA-22B VHF radio, the Bendix/King NVA-22A navigation receiver, the Bendix/King GSA-25B global positioning system (GPS) receiver and the Weston Instruments Model 888 glide slope indicator.

Originally the IL-28s wore the standard overall silver finish (except that all maintenance stencils were in English), with no 'embellishments'. Soon, however, 'extras' began appearing. Thus, in 1962-69 NH-1 had the foremost engine cowling sections painted blue. The first three aircraft had a red pennant painted on the tail to identify them as target tugs; moreover, NH-2 and NH-3 had the foremost detachable engine cowling sections, the wingtips (and sometimes the tip tanks as well) and stabiliser tips painted Day-Glo orange for a while – again in keeping with their target-towing role. In contrast,

Below and opposite page, bottom: NH-4 on the same hardstand. Note the offset towing line conduit, the ejection seat warning triangle and rescue markings on the nose and the abbreviated c/n.



The Finnish Air Force IL-28s

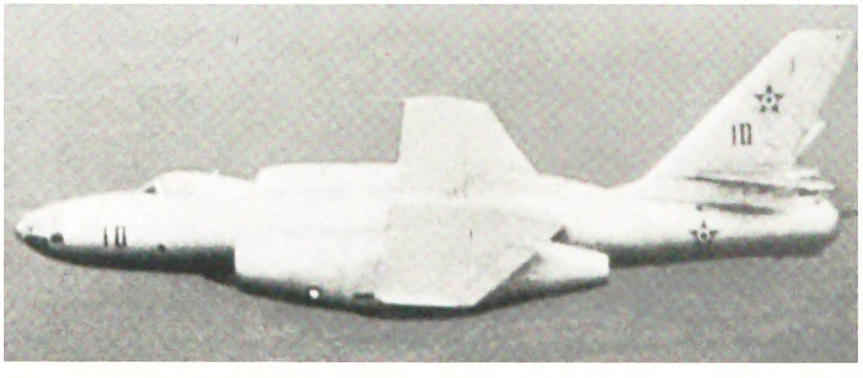
Serial	Version	C/n	Notes
NH-1	IL-28	53005706	Ex-Soviet Air Force, manufacture date unknown, c/n painted on as 5706. Overhauled before delivery 24-11-1959. D/D 28-1-1960; TOC by the Finnish Air Force 30-1-1960, first flight in Finland 13-7-1960. Nose number '01' (1962-69), later '1'; target tug markings on tail only. DBR on landing Utti 30-11-1976, SOC 10-11-1977, scrapped
NH-2	IL-28R	5901710	Ex-Soviet Air Force, mfd 24-10-1955; c/n painted on as 1710. Overhauled before delivery 10-6-1961 with TTSN 600 h; D/D 23-6-1961, TOC 24-6-1961, first flight in Finland 7-7-1961. Nose number '02' (1963-71), later '2'; target tug markings on tail (1963 onwards), nacelles and wings (1974 and 1975-81). Last flight from Oulu to Utti 12-6-1981 and WFU, SOC 29-9-1981, scrapped
NH-3	IL-28R	5901713	Ex-Soviet Air Force, mfd 28-10-1955, c/n painted on as 1713. Overhauled before delivery 18-12-1965 with TTSN 1,246 h; D/D and TOC 3-1-1966. Nose number '03' (1969-70), later '3'; target tug markings on tail (1963 onwards), nacelles and wings (1972-75). Last flight from Oulu to Utti 30-6-1981 and WFU, SOC 29-9-1981, scrapped
NH-4	IL-28R	5901106	Ex-Soviet Air Force, mfd 14-10-1955, c/n painted on as 1106. Overhauled before delivery 18-12-1965 with TTSN 982 h; D/D and TOC 3-1-1966. Nose number '4'; target tug markings on tail (1968-71). Damaged 17-4-1968 but repaired. Last flight from Utti to Luonetjärvi 28-3-1979 and WFU, SOC 3-5-1979; preserved *Keski-Suomen Ilmailu Museo* (Central Finland Aviation Museum), Tikkakoski AB

despite also being capable of target-towing, NH-4 never had the Day-Glo markings because it was mainly tasked with reconnaissance.

Shortly after delivery the serial digit was repeated large on the nose for quick identification. On the first three aircraft it originally had a zero added in front – '01', '02' and '03'; the zero was deleted later. NH-4 stood out from the lot again, as it carried the nose number only as '4' (never as '04'). Finnish-language 'Danger, ejection seat' warning triangles ('*Vaara, heittoistuin*') and 'Rescue' arrows ('*Pelastus*') were added in the late 1960s.

The IL-28s were periodically dispatched to the Soviet Union for refurbishment; NH-1 was overhauled by the 712th ARZ in Chelyabinsk and the IL-28Rs by the 358th ARZ in Omsk. In so doing the crafty Finns often substituted good parts on the aircraft scheduled for an overhaul with defective ones from an unserviceable *Beagle* (this was particularly the case with radar components), thus obtaining extra spares by trickery! Less heavy maintenance and repairs were done by the maintenance shop of KuljLLv at Utti. As for the personnel, two more generations of IL-28 aircrews and ground crews were trained in Finland in 1965-66 and 1970-74. No more airmen were trained to fly the *Beagle* after 1974 because it was clear that the type was due for replacement; a decision to retire the type was taken in 1978.

A Hungarian Air Force IL-28, '10 Red', in cruise flight.



In the late 1970s the IL-28 became increasingly difficult to operate because spares were getting harder to obtain and the Soviet aircraft repair plants had stopped overhauling the type. Hence two of the IL-28s (including NH-1, which had been written off in an accident) were cannibalised to keep the others flying. In the final two years the two airworthy examples were used only for target-towing during the Air Force's annual exercises. The Finnish Air Force finally phased out the IL-28 in 1981 after 20 years of sterling service. Its target-towing and photo reconnaissance duties were taken over in 1982 by three specially modified Gates Learjet 35A business jets operated by the 2nd Flight of the Air Support Squadron (*Tukilentolaivue*) at Tikkakoski AB, Jyväskylä.

Hungary

The information on the IL-28s operated by the **Hungarian Air Force** (HuAF, or *Magyar Legierö*; now known since 1991 as MHRC – *Magyar Honvédség Repülö Csapatai*) is rather sketchy. Some sources say the HuAF introduced the IL-28 in late 1954/early 1955. 37 examples were initially on strength with a single regiment based at Kunmadaras. A second *Beagle* regiment, the 82nd *Végyes Repülö Hadosztály* (bomber regiment), was established later at Kecskemet. Little else is known, except that the last IL-28s were retired in 1972. (Some sources, however, give rather different in-service dates for the Hungarian IL-28s – 1962 to 1970.)

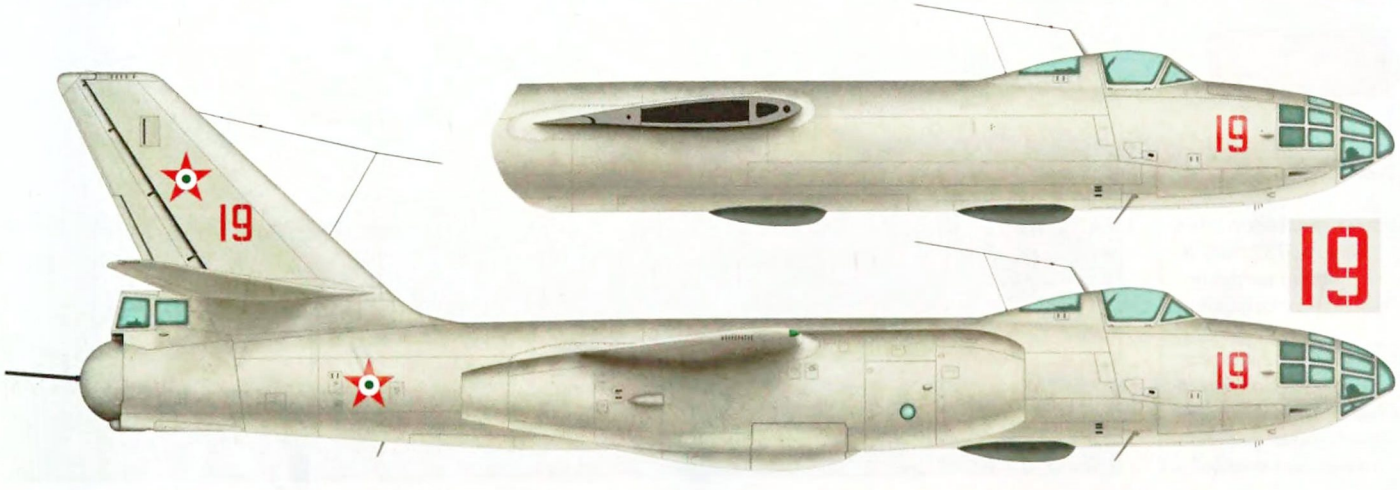
Indonesia

After Indonesia had been a Dutch colony for nearly 350 years, an uprising against colonial rule began in August 1945 immediately after the Dutch East Indies had been liberated from Japanese occupation, sparking a four-year liberation war. The Netherlands began what it called a 'police action' to quell the mutiny but, under international pressure, eventually recognised the country's independence on 27th December 1949. In the

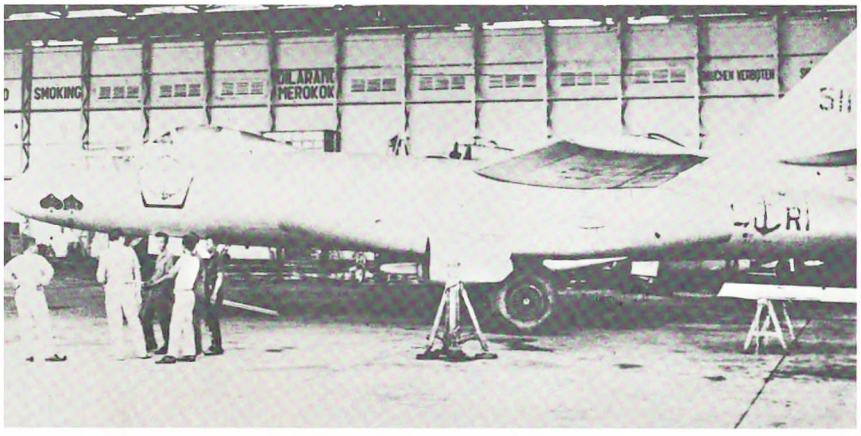
Known Hungarian Air Force IL-28s			
Serial	**Version**	**C/n**	**Notes**
10 Red	IL-28	530512710	
14 Red (1)	IL-28	55006414	D/D 1962 and returned to the Soviet Union same year
14 Red (2)	IL-28U	64008914	Crashed 7-8-1965. Also reported as D/D 1965 and returned to the Soviet Union same year!
19 Red	IL-28RTR	530512719	Often reported in error as a Romanian Air Force aircraft
20 Red	IL-28	...20?	Preserved *Ozigetvar Muzeum*, Vécses, in fake Soviet Air Force markings
25 Red	IL-28U	6*0**925	Crashed 7-8-1965
34 Red	IL-28	55006434	C/n reported as 55056434! Previously reported in error as c/n 56424. Crashed 13-2-1962
44 Red	IL-28	55006444	Wfu 1970
47 Red	IL-28	55006047	Derelict Kécskemet storage depot
50 Red	IL-28	...50?	Preserved *Magyar Repulöstörteneti Muzeum*, Szolnok
55 Red	IL-28	55006455	C/n reported as 55056455 and as 56455! Reported as crashed 13-2-1962 (probably DBR). Preserved Smooth and Nice Aviation Museum, Szolnok
71 Red	IL-28	...71?	
72 Red	IL-28	...72?	
T1 Red	IL-28U	65009420	DBR 8-8-1964; SOC 31-12-1966
?? Red	IL-28U	64008914	Crashed 7-8-1965

'19 Red' a Hungarian IL-28RTR, seen on landing approach.

Below: Hungarian Air Force IL-28RTR '19 Red', with scrap view showing the tandem radomes.



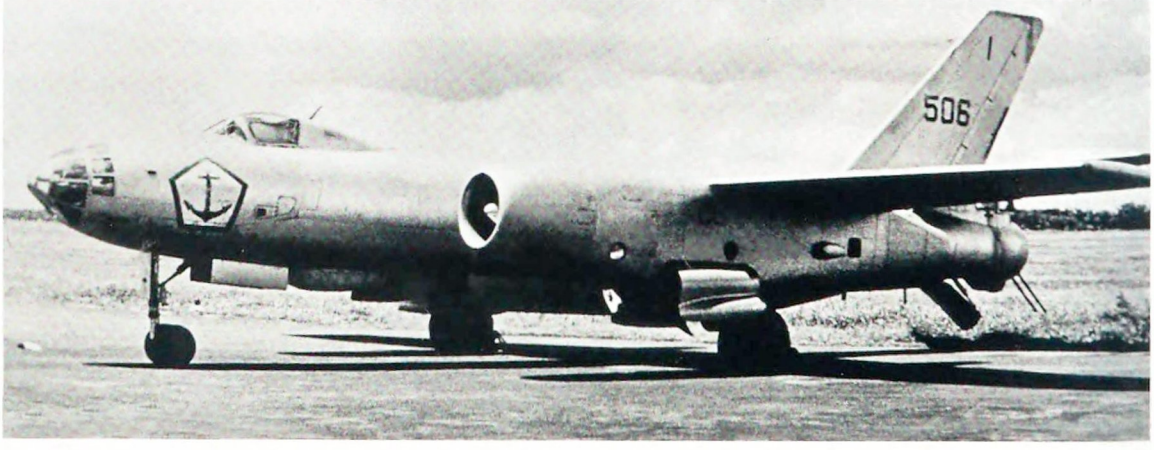
Hungarian Air Force IL-28 '55 Red'; note the ECM aerials under the rear fuselage



Indonesian Navy IL-28U '511' in a hangar. Note the ALRI titles separated by an anchor on the rear fuselage and the 'two spades' nose art.

early 1960s Dr. Ahmed Soekarno (also spelled Sukarno), Indonesia's first President, pursued a left-wing course, abetting the Indonesian communists at the expense of the military and the Islamists. The Soviet Union, which had established diplomatic relations with Indonesia in 1950, perceived this as an opportunity to gain a foothold in the region. Hence when Soekarno was in office Indonesia was on fairly good terms with the Soviet Union and enjoyed Soviet military aid in its struggle against the Netherlands – or, more precisely, Dutch attempts to re-colonise Indonesia.

The first Soviet bomber to see service in Indonesia was the IL-28. 37 such aircraft were supplied in 1961.



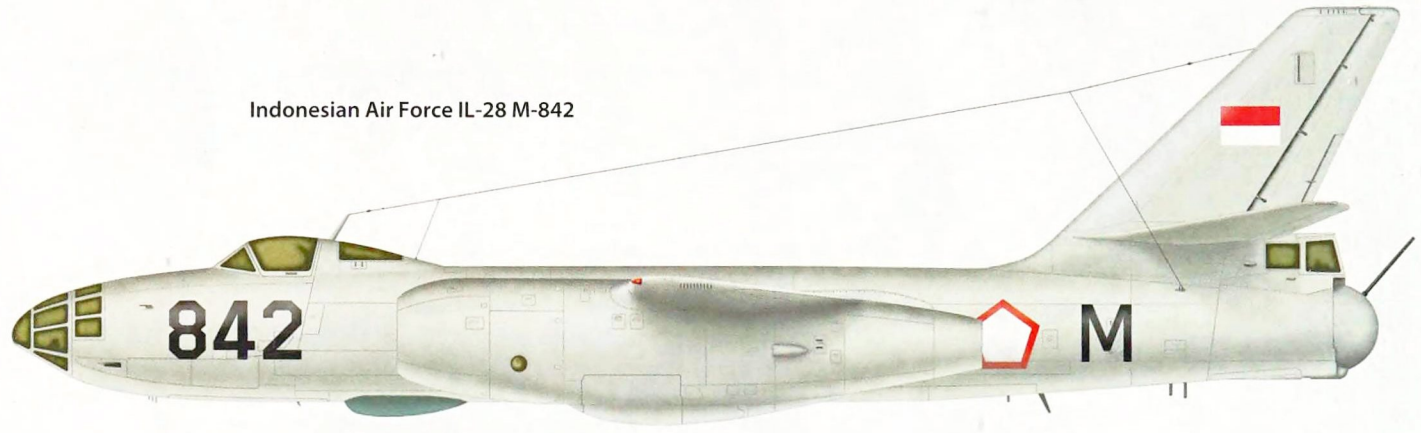
Above right: Indonesian Navy IL-28T '506' in rather neglected condition.

Right: The same torpedo-bomber in better days. Note the open gunner's entry hatch.

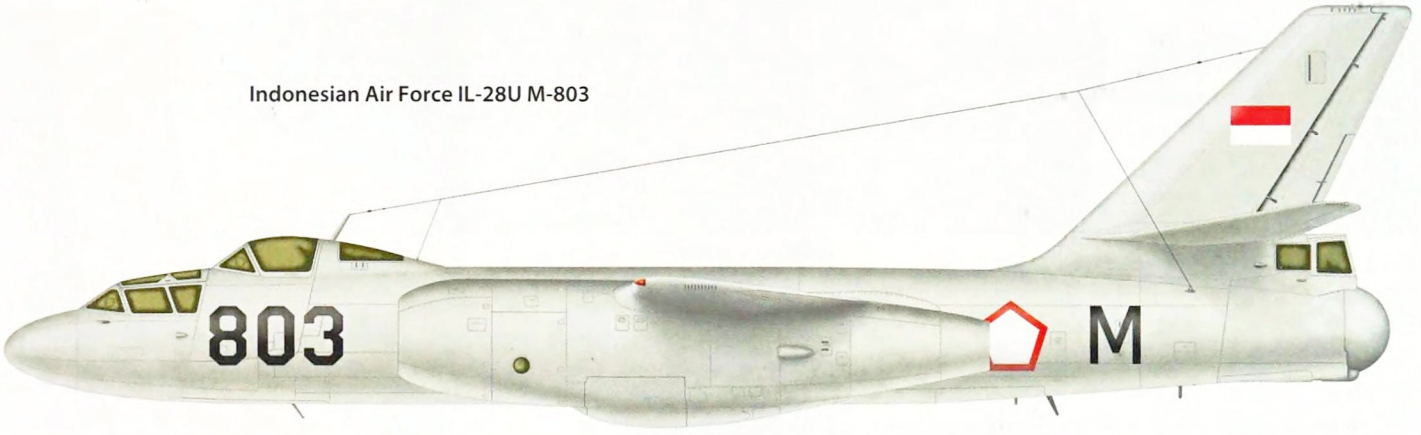
Indonesian Air Force IL-28 M-842 taxies past two sister ships at Surabaya, including M-844. The letter M was painted on the rear fuselage.

The AURI also operated a few IL-28U trainers, including M-803.

Indonesian Air Force IL-28 crews and tech staff lined up beside the bombers at Surabaya, with M-845 nearest.



Indonesian Air Force IL-28 M-842

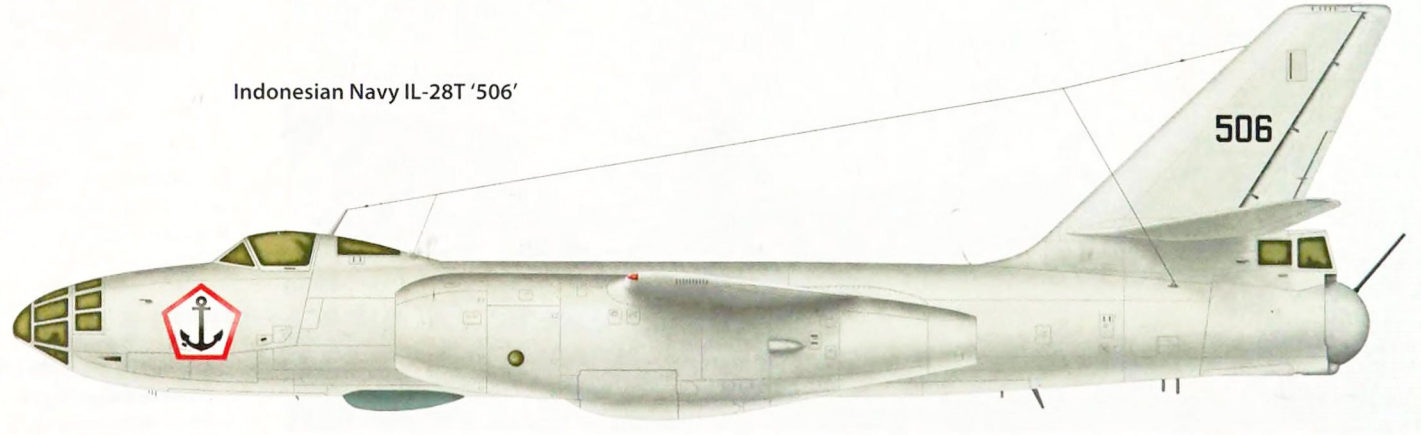


Indonesian Air Force IL-28U M-803

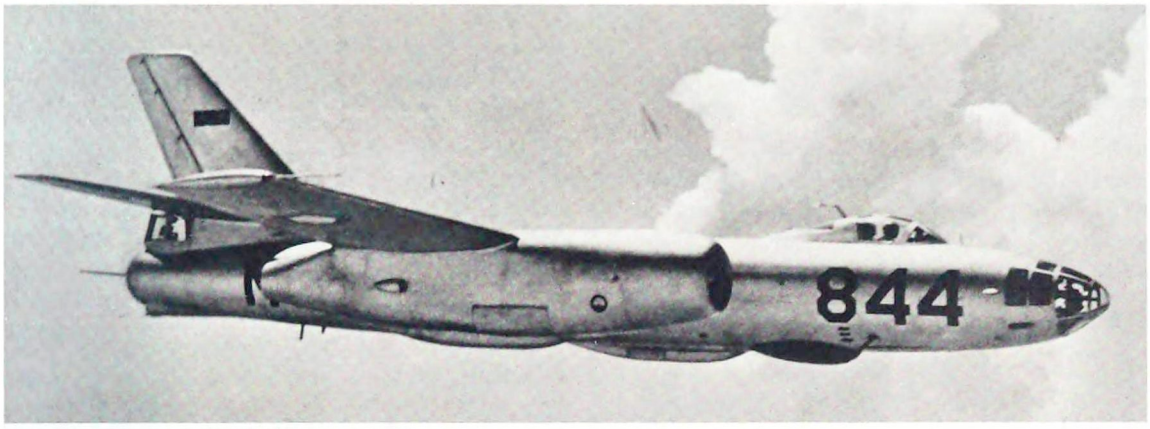
Some sources claim they came from Czechoslovak Air Force stocks; however, a look at the Czechoslovak section of this chapter disproves this, as virtually all CzAF *Beagles* were struck off charge well after 1961 and thus could not have been exported to Indonesia. On the other hand, Czechoslovakia served as a training base for the Indonesian crews.

25 of the twinjets – 13 IL-28 *sans suffixe* bombers, six IL-28R reconnaissance aircraft and six IL-28U trainers – were delivered to the **Indonesian Air Force** (AURI – *Angkatan Udara Republik Indonesia*; now called TNI-AU, *Tentara Nasional Indonesia – Angkatan Udara*). In keeping with then-current practice these received alphanumeric serials which were assigned in separate blocks for each version – possibly with a view to creating the false impression that the AURI had more IL-28s than it actually had. The aircraft equipped the No.1 and No.21 squadrons based in Surabaya.

The other 12 aircraft – ten overhauled IL-28T torpedo-bombers, together with a stock of 59 RAT-52 torpedoes, and two IL-28Us – entered service with the **Indonesian Navy** (ALRI – *Angkatan Laut Republik Indonesia*; now called TNI-AL, *Tentera Nasional Indonesia – Angkatan Laut*). These had number-only serials in the 5xx range and served with No.500 Sqn at Naval Air Station Juanda, also in Surabaya.

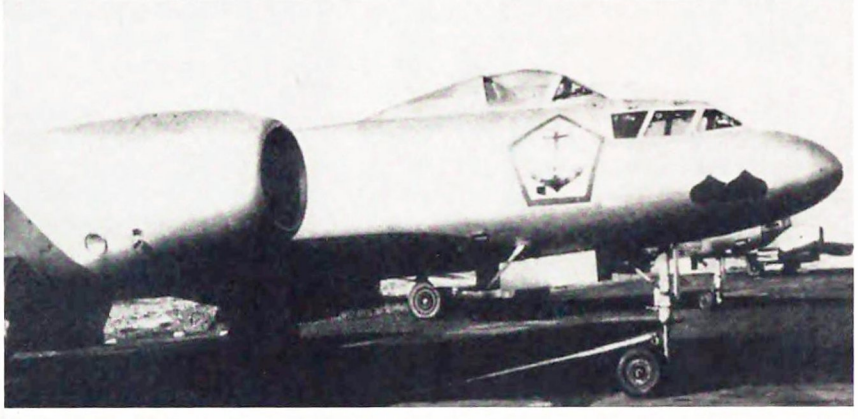


Indonesian Navy IL-28T '506'



An air-to-air of another AURI IL-28 bomber serialled M-844.

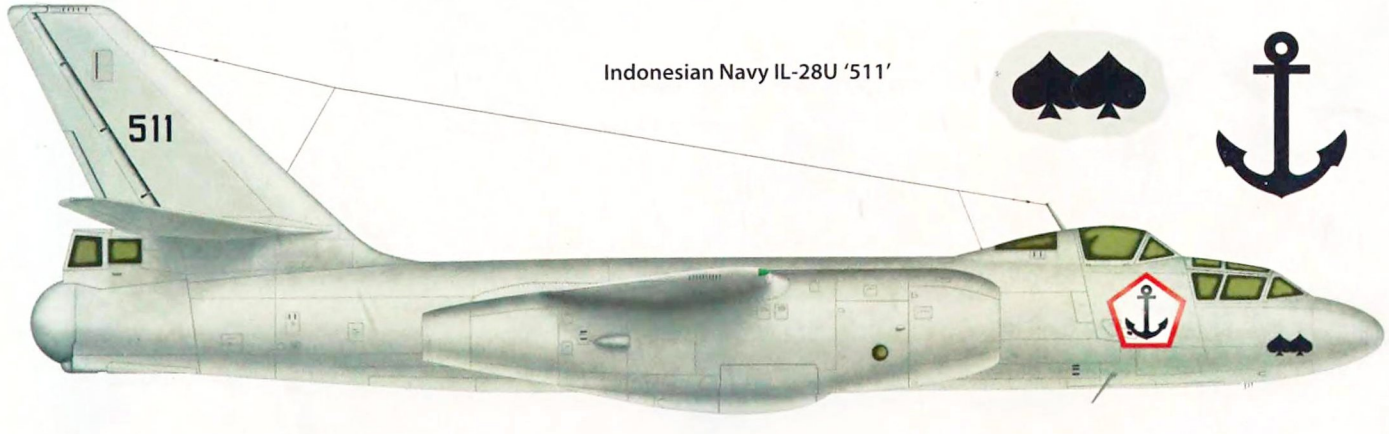
In the spring of 1961 Indonesia completed the nationalisation of the Dutch enterprises. However, the Netherlands was not about to let go of its former colony so easily. Pretty soon the two nations locked horns over the province of West Irian (aka West Papua; formerly Dutch New Guinea), which the Dutch still controlled and which they wanted to transform into a separate country. After trying unsuccessfully to gain control of the province politically (via the United Nations) President Soekarno decided to seize it by military force. In December 1961 Indonesia launched Operation *Trikora* to infiltrate and annex Dutch New Guinea. The tension mounted; the Netherlands dispatched a



The nose of IL-28U '511', showing the 'Two of Spades' nose art and the ALRI insignia.

Another aspect of '511', one of the two Indonesian Navy IL-28U trainers.

Indonesian Navy IL-28U '511'



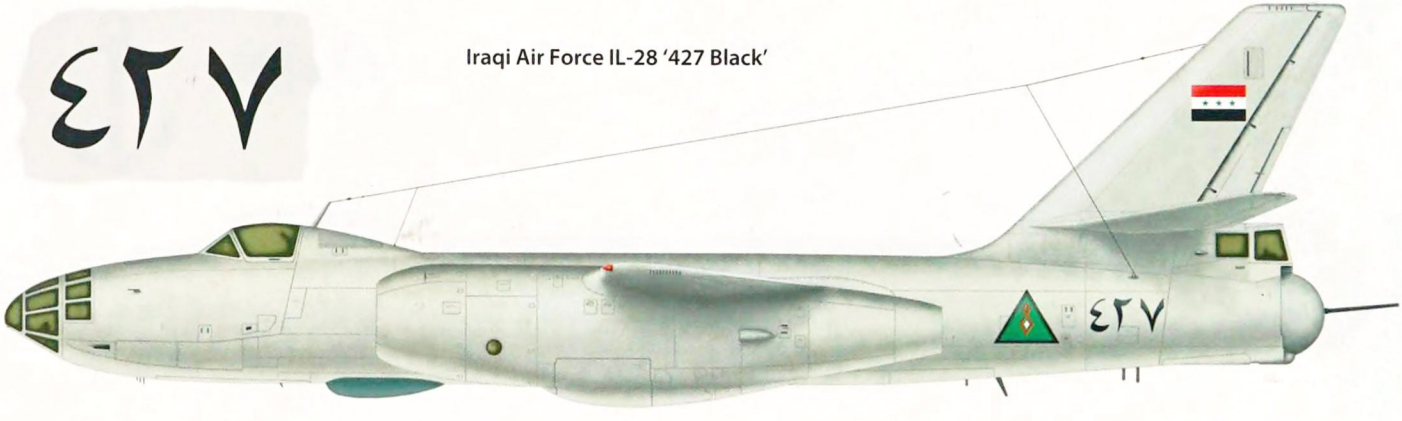
The Indonesian Air Force IL-28s			
Serial	**Version**	**C/n**	**Notes**
M-801	IL-28U	?	
M-802	IL-28U	?	
M-803	IL-28U	?	
M-804	IL-28U	?	
M-805	IL-28U	?	
M-806	IL-28U	?	
M-820	IL-28R	?	
M-821	IL-28R	?	
M-822	IL-28R	?	
M-823	IL-28R	?	
M-824	IL-28R	?	
M-825	IL-28R	?	
M-840	IL-28	?	
M-841	IL-28	55006749	
M-842	IL-28	?	
M-843	IL-28	?	
M-844	IL-28	?	
M-845	IL-28	?	
M-846	IL-28	?	
M-847	IL-28	?	
M-848	IL-28	?	
M-849	IL-28	?	
M-850	IL-28	?	
M-851	IL-28	?	
M-852	IL-28	?	

The Indonesian Navy IL-28s			
Serial	**Version**	**C/n**	**Notes**
501	IL-28T	?	
502	IL-28T	?	
503	IL-28T	?	
504	IL-28T	?	
505	IL-28T	?	
506	IL-28T	?	
507	IL-28T	?	
508	IL-28T	?	
509	IL-28T	?	
510	IL-28T	?	Gate guard at NAS Juanda, Surabaya, with ALRI titles
511	IL-28U	?	
512	IL-28U	?	

task force, including the Royal Dutch Navy's only aircraft carrier HNLMS *Karel Doorman* (R81), and things were moving towards war. The USA, which placed the entire globe within the sphere of its strategic interests, sided with the Netherlands; in turn, the Jakarta government sought assistance from the Soviet Union.

As part of Operation *Trikora*, 18 IL-28s were deployed at Laha AB, but soon moved to Amahai airfield on Seram Island, which had a longer runway. Apart from that, the AURI had 40 MiG-17Fs and MiG-17PFs at Morotai, Amahai and Letfuan (on the Banda Islands in the southwest of Papua) – primarily for the purpose of escorting the transports that were to airlift personnel and supplies to West Irian during the planned infiltration phase of Operation *Trikora*. Should the Netherlands go to war, the MiGs were to escort the IL-28s and the AURI's Tu-16 heavy bombers. Eventually, on 15th August 1962 the Dutch signed the New York Agreement, handing over West Irian to the United Nations Temporary Executive Authority for subsequent integration into Indonesia, and the invasion was called off.

However, President Sukarno's autocratic ruling style, together with the growing military expenditures that overtaxed the national budget, were causing growing opposition against him. After an unsuccessful communist coup attempt on 30th September 1965 (the so-called 30th September Movement), a violent wave of repressions against civilian and military communist sympathisers swept the country. Soviet support was promptly withdrawn and, predictably, all Soviet-built aircraft were soon grounded by lack of spares. From then on, President Sukarno slowly lost power and the staunchly anti-Communist Maj.-Gen. Mohammed Suharto seized power in March 1966, installing a military dictatorship. Suharto favoured the USA as an arms supplier, and most of the Warsaw Pact aircraft were



Iraqi Air Force IL-28 '427 Black'

withdrawn in 1970. The last *Beagles* were retired in June 1972.

Iraq

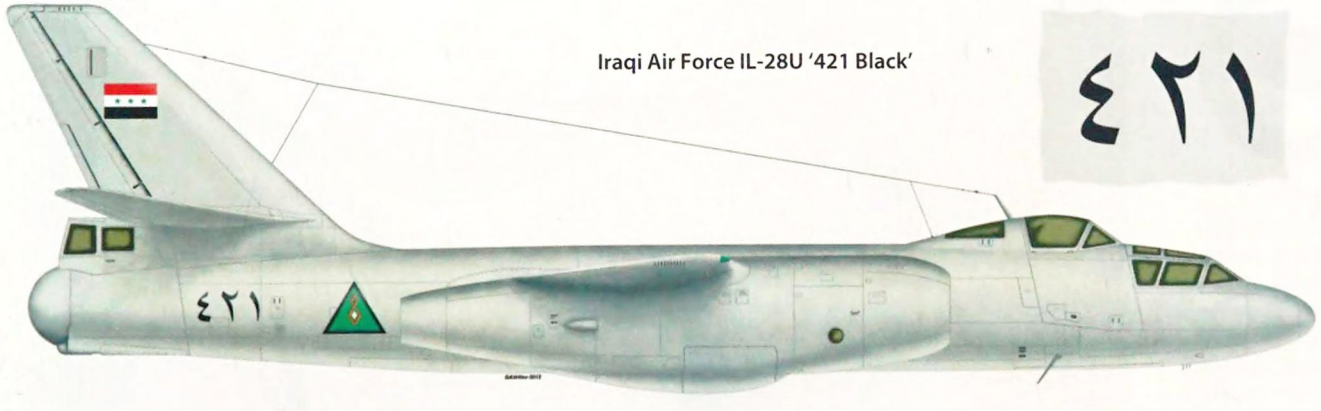
The **Iraqi Air Force** (IrAF, or *al Quwwat al-Jawwiya al-Iraqiya*) originated as the Royal Iraqi Air Force (RIAF) in 1931, changing its name after the revolution on 14th July 1958 in which King Faisal II was assassinated and the Republic of Iraq was established. After the revolution, the Soviet Union and its Warsaw Pact allies (notably Czechoslovakia) established ties with the new republic and started supplying armaments right away; these included aircraft for the IrAF. Shortly after the revolution the new Commander-in-Chief of the IrAF, Brig. Gen. Jalal Jaffar al-Awqati, arranged a large order for military hardware, including IL-28 bombers.

Inevitably, the aircraft were supplied from Soviet Air Force stocks, since the IL-28 was no longer in production. The bombers were delivered via Egypt in 1958; enough were delivered to equip a single bomber squadron (No.8 Sqn). The unit's location is a bit controversial. Some sources report that No.8 Sqn was established at Rashid AB (also rendered as al-Rasheed) on the south-eastern outskirts of Baghdad on 10th February 1960; however, it is known that the squadron was officially declared operational on 4th May 1960 at Tammuz AB near Habbaniyah (the former RAF Habbaniyah) located 89 km (55 miles) west of Baghdad. Later the unit moved to Wahda AB near Basra, southern Iraq. The *Beagles* superseded the RIAF's de Havilland Venom FB.50 fighter-bombers.

As was customary in the Middle East until Six-Day War experience taught the Arabs otherwise, the IL-28s had a natural metal finish. At first they wore a fin flash consisting of black, white and green stripes (left to right), with a stylised eight-pointed red star in the centre. In 1962 this was changed to a fin flash of red, white and black stripes (top to bottom), with three small green pentastars on the white stripe. The wing and fuselage insignia – a green equilateral triangle edged in

Known Iraqi Air Force IL-28s

Serial	Version	C/n	Notes
421 Black	IL-28U	69808	Full c/n 65009808. Wfu al-Taqaddum AB
422 Black	IL-28U	69520	Full c/n 65009520. Wfu al-Taqaddum AB
423 Black	IL-28	?	Wfu al-Hurrya AB, Mosul, by 9-1980
424 Black	IL-28	?	
425 Black	IL-28	56605703	Omsk-built. Wfu al-Taqaddum AB
426 Black	IL-28	56605704	Wfu al-Taqaddum AB
427 Black	IL-28	56605717	Natural metal finish, old (second type) fin flash, later new insignia. Wfu al-Taqaddum AB
428 Black	IL-28	?	
429 Black	IL-28	?	Wreck dumped at al-Bakr AB
430 Black	IL-28	56606206	Wfu al-Taqaddum AB
431 Black	IL-28	?	
432 Black	IL-28	56606540	Shot down by Turkish Air Force Republic F-84F over Turkey 16-8-1962
433 Black	IL-28	?	Natural metal finish, old (second type) fin flash
434 Black	IL-28	56606207	Wfu al-Taqaddum AB
437 Black	IL-28	?	Wfu al-Taqaddum AB
564 Black	IL-28R	5901703	Irkutsk-built, converted to target tug. Wfu al-Taqaddum AB
565 Black	IL-28R	5901801	Irkutsk-built, converted to target tug. Wfu al-Taqaddum AB



Iraqi Air Force IL-28U '421 Black'

black with a stylised version of the Arab word *jaish* (Army) in the centre – remained unchanged.

The Iraqi IL-28s did not participate in the Six-Day War of 1967. Instead, they were used operationally against the rebellious Kurdish minority in the north, and one bomber was shot down by a Turkish Air Force fighter after straying into Turkish airspace on 16th August 1962. The No.8 Sqn re-equipped with 20 Su-7BMK supersonic fighter-bombers in 1969, and the IL-28s (some of which had gained a desert camouflage scheme by then) were transferred to an unidentified unit. Eventually they were retired at al-Taqaddum AB near Habbaniyah, 74 km (46 miles) from Baghdad. They were still there when the base was overrun by US Army forces during Operation *Iraqi Freedom* in 2003.

Morocco

The **Royal Moroccan Air Force** (*al Quwwat al-Jawwiya al-Malakiya Marakishiya*, or *Aviation Royale Chérifienne*) operated a mere two or four IL-28s supplied by the Soviet Union in 1963.

Nigeria

When a civil war broke out in Nigeria in May 1967, the Nigerian government started looking abroad for help. Egypt offered military aid, supplying a number of second-hand combat jets, including at least six IL-28 bombers to the **Federal Nigerian Air Force** (FNAF). (Some sources, though, claimed that some of the bombers came from Algeria or from Syria.)

The first IL-28s arrived at Kalabar in May 1968, quickly commencing operations against the Ibo separatists. The bombers were flown and maintained by Egyptian crews. The aircraft wore wraparound green/dark brown camouflage.

North Korea

When the Allied forces liberated the Korean Peninsula in August 1945, ending 35 years of Japanese occupation, Korea was divided along the 38th Parallel, with Soviet troops stationed north of it and American troops south in accordance with the agreements made in Yalta and

A camouflaged Federal Nigerian Air Force IL-28; unfortunately the serial is obscured.

Another A Nigerian IL-28 wearing a rather different and crude camouflage scheme.

The same IL-28 taxies out at Abuja, showing what looks like a large identification letter P on the nose – possibly the original EAF serial.

Known Federal Nigerian Air Force IL-28s

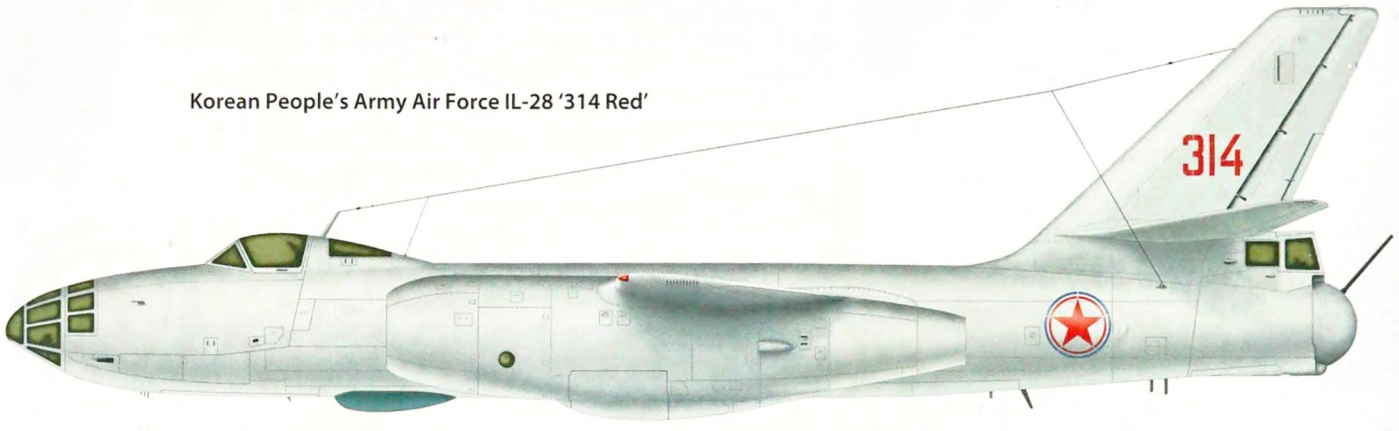
Serial	Version	C/n	Notes
P	IL-28	?	Code is former UARAF serial?
NAF 635	IL-28	?	Photo exists
NAF 801	IL-28	?	
NAF 802	IL-28	?	
NAF 803	IL-28	?	
NAF 804	IL-28	?	
NAF 805	IL-28	?	Ex-Syrian AF '208'? Derelict Lagos by 1978; later preserved Nigerian War Museum, Umuahia
NAF 806	IL-28	?	

Potsdam. Pretty soon the USA pressed a United Nations decision on the holding of elections in the US-occupied southern half of Korea; these were held in May 1948, and the Republic of Korea (RoK), commonly known as South Korea, was proclaimed on 15th August that year. In response, the People's Democratic Republic of Korea (PDRK), or North Korea, was proclaimed on 9th September 1948. The Soviet Union was the first nation to recognise the PDRK on 12th October 1948, becoming its chief military partner and helping to set up and equip the **Korean People's Army Air Force** (KPAAF).

24 IL-28s were reportedly delivered to the KPAAF before the end of the Korean War; ten of them took part in the victory parade in Pyongyang on 28th July 1953. In the early 1960s Communist China began rebuilding the KPAAF, exporting obsolete ex-PLAAF equipment to North Korea in contravention of the ceasefire treaties; this included 70 IL-28s and Chinese-built Harbin H-5s delivered by sea. Deliveries continued until the mid-1960s when relations between China and North Korea deteriorated. The bombers saw service with the 8th Air Division and were based at Orang. Even in the

Korean People's Army Air Force B-5s make a low pass over several more *Beagles* on the flight line.

A surveillance satellite image of North Korean B-5s at Uiju AB



Korean People's Army Air Force IL-28 '314 Red'

Known Korean People's Army Air Force IL-28s			
Serial	**Version**	**C/n**	**Notes**
314 Red	IL-28	?	Natural metal finish
0220 Red	IL-28R	?	Natural metal finish
44 Black	Harbin H5	?	Dark green camouflage with natural metal undersurfaces and red rudder
45 Black	Harbin H5	?	Dark green camouflage with natural metal undersurfaces and red rudder

2000s, some 80 H-5s and HZ-5 reconnaissance aircraft (similar to the IL-28R) were reportedly on strength with the 1st Air Combat Division headquartered in Kaechon (an unidentified bomber regiment at Uiju) and the 2nd Air Combat Division headquartered in Toksan (two unidentified bomber regiments at Changjin-up AB and Orang AB) – allegedly in flying condition.

Pakistan

The Republic of Pakistan, which came into existence on 14th August 1947, established diplomatic relations with the Soviet Union as early as 1948. However, the Pakistani political establishment was pro-western from the outset and Pakistan was a member of the SENTO and SEATO military blocs (in 1954-79 and 1955-72 respectively).

Although the tell-tale smoke puffs are not visible, the flap setting on this Polish Air Force IL-28 serialled '50 Red' suggests the bomber has just touched down.

Even more to the point, the Soviet Union was an ally of Pakistan's geopolitical arch-rival, India, which supported separatism in Eastern Pakistan (the latter province seceded in 1972 to become Bangladesh). All of this meant that no deliveries of Soviet aircraft to the **Pakistan Air Force** (PAF, or *Pakistan Fiza'ya*) could take place.

Yet, however improbable it may seem, the IL-28s found their way to Pakistan – via a circuitous route. The USA, which had been the primary arms supplier to Pakistan, withdrew all military support in the wake of the Second Kashmir War between India and Pakistan in 1965, embargoing arms deliveries to both belligerents. With no more spares forthcoming for its US-built combat aircraft, the PAF was faced with the daunting prospect of being grounded entirely – or finding replacement aircraft. China, which was not on friendly terms with India, stepped into the breach, signing a deal with Pakistan in 1965 on the delivery of combat jets. Thus, the formula 'my friend's friend is my friend' sometimes equates to 'my enemy's enemy is my friend'.

The abovementioned deal with China included the delivery of 14 Soviet-built IL-28 tactical bombers to the PAF. They were intended as a possible replacement for the Martin B-57B bombers that had been grounded by the spares shortage caused by the US embargo; this gave an odd twist to the matter, since the B-57 was an American version of the English Electric Canberra, and the IL-28 was dubbed the 'Soviet Canberra'. The *Beagles* were delivered in 1966 – enough aircraft to equip an entire squadron. Moreover, Pakistan was negotiating the delivery of 30 to 40 IL-28s directly from the Soviet Union in 1969. Had such a deal gone through, it would inevitably have caused the Indo-Soviet relationship to sour.

Eventually, however, the PAF arranged to buy an adequate supply of Wright J65 turbojets for the B-57s in France, so the IL-28s were put in storage and never flown. Pakistan denied Indian claims that it was using the type operationally.

Seven Polish Air Force IL-28s parked on the ground next to a paved taxiway. '20 Red' nearest to the camera has the Rym-S targeting system.

Poland

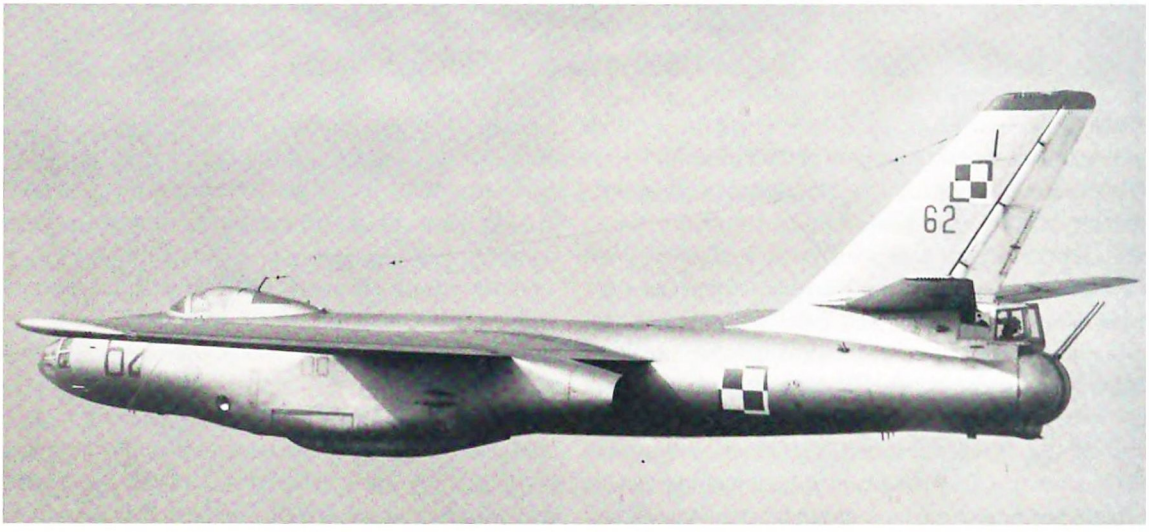
In 1950 the bomber component of the **Polish Air Force** (PWL – *Polskie Wojsko Lotnicze*) consisted of a single unit, namely the 7. PLB (*pułk lotnictwa bombowego* – 7th Bomber Regiment) at Ławica equipped with obsolete and well-worn Pe-2 dive bombers. Growing Cold War tensions soon led the PWL command to expand this to the 15. DLB (*dywizja lotnictwa bombowego* – 15th Bomber Division) at Malbork which comprised the 7. PLB, the 33. PLB (established in 1950) and the 35. PLB (established in 1951). However, the Pe-2s and the Tu-2 bombers equipping the newly established regiments no longer met the demands of the day. Therefore, shortly before the 15. DLB moved from Malbork (which was too crowded for an entire bomber division) to a larger and better-equipped base at Bydgoszcz, a decision was taken to order the IL-28 jet bomber.

Theoretical training of IL-28 flight and ground crews at Bydgoszcz began in the autumn of 1952; the first eight IL-28s arrived on 31st October that year. The first IL-28U trainer was delivered to the PWL on 11th December 1952 together with the second batch of six bombers, facilitating conversion training. The latter was undertaken by Soviet instructors, some of whom were seconded from the GSOVG in East Germany.

Polish IL-28R '30 Red' is refuelled before a sortie. The serial has faded away almost completely.

A long row of 15. DLB IL-28s at Modlin AB. Two trainers serialled 'S1' and 'S5' are nearest, with the first IL-28 bomber delivered to Poland (aptly serialled '1 Red') next in line.

An air-to-air study of IL-28 '62 Red'. The aircraft of the 15. DLB had differently coloured fin caps to differentiate the three regiments at Bydgoszcz (and subsequently Modlin).



A pair of *Beagles* led by '59 Red' line up for a formation take-off.

13 more *Beagles* were delivered in January 1953, followed by a further nine on 26th February. The type attained initial operational capability in early 1953, allowing the piston-engined Tu-2 and Pe-2 bombers to be retired. Thus the second stage of upgrading the PWL was completed; the first was the replacement of piston-engined fighters with MiG-15 *Fagot-As*, MiG-15*bis* *Fagot-Bs* and MiG-17F *Fresco-Cs* which were later built under licence by the PZL Mielec factory as the Lim-1, Lim-2 and the Lim-5/Lim-6 series respectively.

After two high-profile defections by Polish pilots from airbases on the Baltic Sea coast in quick succession, and in the PWL's latest MiG-15*bis* fighters at that – a 28. PLM (*pułk lotnictwa myśliwskiego* – 28th Fighter Regiment) aircraft from Słupsk on 5th March 1953 and a 41. PLM aircraft from Malbork on 25th May 1953 – radical measures were taken to prevent any more incidents of the kind. These measures affected the 15. DLB, which redeployed wholesale from Bydgoszcz located some 140 km (87 miles) from the coast to Bemowo AB, a fighter base near Warsaw, some 230 km (143 miles) from the coast. This was a temporary move pending completion of the division's new base at nearby Modlin.

More deliveries to the 15. DLB came on 14th July 1954 (four IL-28Us), 13th August 1954 (seven bombers), 25th August 1954 (seven more *Beagles*), 10th November 1954 (four IL-28Us), 7th April 1955 (three IL-28Us and one bomber), 17th June 1955 (six bombers), 1956 (twelve bombers and four trainers) and 16th January 1957 (the final four bombers). Polish pilots quickly grew familiar with the type and performed well during national and Warsaw Pact military exercises.

In 1955 the 21. PLZ (*pułk lotnictwa zwiadowczego* – 21st Reconnaissance Air Regiment) at Bielice AB (pronounced '*Be**lit**se*') located 6 km (3.73 miles) from Sochaczew (pronounced '*So**kha**chev*') also re-equipped with the *Beagle*. The unit received its first three IL-28Rs on 20th May and became the 21. SPLR (*samodzielny pułk lotnictwa rozpoznawczego* – 21st Independent Reconnaissance Air Regiment) on 29th November. Six more IL-28Rs followed in 1956 (some sources say it was four in 1955 and five in 1956). All nine aircraft were Irkutsk-built; they served with the regiment's Sqn 3, known as 3. *Eskadra Dalekiego Rozpoznania* (long-range reconnaissance squadron). Occasionally the IL-28Rs were used for photo mapping in the interests of the civil authorities. In addition, the 21. SPLR had ten *Beagles* in the bomber version and four IL-28Us.

The Polish IL-28s had a natural metal finish that was livened up a bit by coloured fin tips whose colour varied, depending on the regiment operating the aircraft. The *Beagles* wore one-, two- or three-digit serials that appeared to run in sequence. The IL-28Us had alpha-numeric serials which originally commenced with U; in 1956 this prefix was changed to S, standing for [*samolot*] *szkolny* (trainer), reflecting the aircraft's unofficial local designation 'SIł-28'.

Also in 1955, three IL-28 bombers and a single IL-28U trainer were transferred to OSL-4 (*Oficerska Szkoła Lotnicza* – Officers' Flying School) in Dęblin (pronounced '***Dem**blin*'), popularly known as *Szkoła Orląt* (Eaglets' School). The aircraft served with the school's 23. *Eskadra Szkolna* (23rd Training Squadron). In 1957, however, OSL-4 was reorganised and stopped training bomber crews; this was now the responsibility of the 35. PLB, which was reorganised as the 35. PLSzB (*pułk lotniczy szkolno-bojowy* – 35th Combat Training Air Regiment, or operational conversion unit). Perhaps inevitably for an OCU, accident attrition was rather high, and as early as 19th May 1958 the 35. PLSzB was disbanded due to fleet depletion and the unit's poor flight safety record.

In 1957 the Polish Air Force retired its last five Tu-2s which were used as target tugs. To avoid being left without any target-towing capability, in 1956 the 15. DLB transferred three IL-28s to the 19. LEH (*lotnicza eskadra holownicza* – 19th Target-Towing Squadron) at Słupsk; the aircrews and ground crews underwent conversion training at Sochaczew on 10th March – 30th June 1957. The aircraft were converted to target tugs, working with sleeve-type targets or Gaczek glider-type targets. Later, as mentioned in Chapter 4, they were retrofitted with indigenous towing winches, working with sleeve-type targets; the latter were equipped with acoustic miss distance detectors, like the ones used by the Finnish *Beagles*. At least one IL-28U was similarly converted. The target tugs were used comparatively briefly for training fighter pilots, being used more for training shipboard AAA crews.

In September 1957 the 7. PLB and the HQ of the 15. DLB moved to a new base – Powidź AB. The division's other two units remained at Modlin.

On 5th-9th October 1959 the PWL held its first Bomber Crew Competition at Powidź; it included daytime and night marksmanship exercises. The daytime exercises were bomb delivery from 400 m (1,310 ft), using the radar; from 8,000 m (26,250 ft), using the Rym-S targeting system; and from 300 m (980 ft), using the optical sight. The night exercises involved bombing from 4,000 m (13,120 ft), using the radar, and from 7,000 m (22,965 ft), using the Rym-S system. The competition also included aerial gunnery. At the end of the day the resident 7. PLB walked away with almost all the prizes; first place went to a crew captained by Lt. Edward Charyszyn. A similar Reconnaissance Aviation Crew Competition was held for the first time at Powidź on 5th-10th September 1961, involving Air Force and Navy aircraft; a flight of 21. SPLR IL-28Rs led by Lt. Józef Cholewa emerged as the winner.

When the 15. DLB was disbanded on 21st March 1963 in the course of a military reform, the 7. PLB was

Here, a debriefing is apparently in progress right on the flight line; with all the aircrews lined up, the man in shades taking centre stage – obviously the unit CO – is making an eloquent gesture to show he is fed up with something or other. IL-28s serialled '9 Red','23 Red' and '45 Red' are visible; the ZiL-164 lorry parked next to the latter aircraft is an APA-2 GPU.

IL-28 '122 Red' taxies out for take-off past sister ship '123 Red'.

transformed into the 7. BLB (*brygada lotnictwa bombowego* – 7th Bomber Brigade), comprising three bomber squadrons and one reconnaissance squadron with IL-28Rs. In accordance with a General Staff directive dated 16th April 1963 the 33. PLB changed its specialisation to become the 33. PLRO (*pułk lotniczy rozpoznania operacyjnego* – 33rd Operational [i.e., theatre-tactical] Reconnaissance Air Regiment) and moved to Powidź. That same day the 21. SPLR switched to a new organisational structure and was renamed 21. PLRT (*pułk lotniczy rozpoznania taktycznego* – 21st Tactical Reconnaissance Air Regiment), ceding its two IL-28 squadrons to the 33. PLRO.

In the mid-1960s ten IL-28 bombers were modified locally for ELINT and ECM duties, using mission equipment supplied by the Soviet Union. Such aircraft were unofficially designated IL-28E (Ił-28E) or IL-28RE (Ił-28RE), serving with the 33. PLRO.

The steady depletion of the IL-28 fleet led to another reorganisation of the PWL's bomber arm in 1968. This saw the 7. BLB and the 33. PLRO being pooled into a new brigade designated 7. BLRB (*brygada lotnictwa rozpoznawczo-bombowego* – 7th Reconnaissance & Bomber Brigade), which had 25 IL-28s *sans suffixe*, ten IL-28Es and five IL-28Rs on strength (but, somewhat surprisingly, no IL-28Us for proficiency training). The

A 'diamond 16' formation of IL-28s from the 7. BLB en route to a flypast during a military parade. Aircraft serialled '5 Red' and '35 Red' can be seen here.

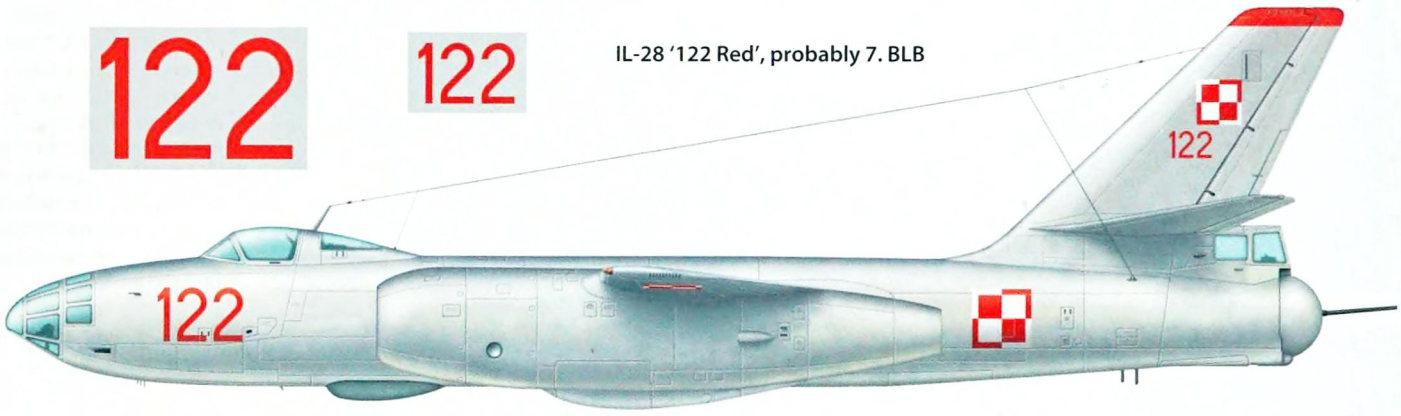
Another view of the same diamond (the so-called *szachownicy* formation) from a chase plane.

new formation 'drew first blood' on East German soil during the Warsaw Pact exercise *Odra-Nysa-69* (thus named after the rivers forming the border with Germany, alternatively known by their German names Oder and Neisse).

The type was also operated by the **Polish Navy** (MW – *Marynarka Wojenna*), though on a much smaller scale. Starting in 1956, a mere six aircraft – two bombers, three IL-28Rs and one IL-28U – saw service with the Navy's 15. SELR (*samodzielna eskadra lotnictwa rozpoznawczego* – 15th Independent Reconnaissance Squadron), which was formed at Siemirowice AB (pronounced '*Semirovitse*') in September 1956. Some sources say the squadron had nine IL-28 bombers and one IL-28U; all the aircraft were transferred from PWL stocks, not delivered new from the Soviet Union. The unit participated in the 1st Reconnaissance Aviation Crew Competition but ended up last. It was a different story during the 3rd Reconnaissance Aviation Crew Competition in 1975, where the 15. SELR emerged as the winner.

The squadron also performed target-towing duties – according to some sources, using a few aircraft 'wet-leased' (that is, seconded together with the crews) from the 35. PLB. However, Edmund 'Bubu' Loroch, who began his duty as GRO with the 15. SELR in the rank of a

Polish Air Force IL-28 '1 Red',
15. DLB, Bydgoszcz, December 1952



IL-28 '122 Red', probably 7. BLB

IL-28U 'S5 Red',15. DLB, Modlin, 1956

IL-28U 'U2 Red', 15. DLB, Bydgoszcz, 1953

IL-28 '75 Yellow'

conscript seaman and then chose a military career, eventually rising to ensign, stated these were the squadron's own aircraft, and that they were in fact operating on behalf of other units. Target-towing in the interests of the naval AA gunners was typically performed over the western part of the Gulf of Gdańsk in the southern Baltic Sea between the town of Hel in the west and the Wisła estuary in the east – a stretch of 27.5 km (17.1 miles) as the crow flies. Occasionally the *Beagles* themselves acted as targets for the gunners, who fired live ammunition. How was this done without recruiting suicidal crews? The guns were adjusted so that the barrels pointed at 20° to the sighting line, the rounds exploding behind the aircraft, and the fuses were set to half the IL-28's flight altitude. Still, this was a pretty hair-raising experience!

Bombing practice took place at the naval target range in the Bay of Puck (pronounced 'Pootsk'; a shallow western branch of the Gulf of Gdańsk); two to four FAB-250 bombs were normally used. As a rule, the target was not an actual hulk of a warship but simply a designated spot on the water. The bombs would go off underwater, producing a lot of dead fish, which the target range team would then salvage and supplement the rations at the local mess! One mess for another mess, so to say.

An interesting episode in the career of the Polish Navy IL-28s was the test of a locally designed nuclear explosion simulation bomb. Unlike the Soviet IAB-3000 and IAB-500 practice bombs (*imitatsi**on**naya **avia**bom**ba* – 'simulation bomb'), which were filled with a flammable liquid and white phosphorus to emulate fairly accurately the flash of a nuclear blast and the tell-tale mushroom cloud, the Polish version was designed to emulate only the cloud. The bomb weighed more than 700 kg (1,543 lb); the glassfibre reinforced plastic (GRP) body shell contained 200 kg (440 lb) of TNT, which was detonated by two TM-24A fuses, and 500 kg (1,102 lb) of soot. Two 15. SELR *Beagles* were used for the test, taking off from Babie Doły AB near Gdynia on the Baltic Sea coast; the bomb was dropped at the Bay of Puck target range between two decommissioned ships standing at anchor 400 fathoms (740 m, or 0.4 nm) from each other.

Edmund Loroch recalled an interesting episode when one of the unit's IL-28s landed at Słupsk (Redzikowo AB) by mistake. Such things happened from time to time when the pilot or navigator wasn't careful, but this time, adding offence to injury, the aircraft was damaged and could not be flown out. The incident occurred on a Friday, which meant the aircraft would be stuck off-base not merely overnight but until Monday; the crew didn't care for the idea of returning to Siemirowice by train, much less the prospect of spending the weekend at Słupsk. Imagine their surprise when another *Beagle* from the 15. SELR landed to pick them up! Two of the crewmen squeezed into the navigator's station, the third was accommodated in the gunner's station, and the IL-28 flew the 45 km (28 miles) back to Siemirowice with six persons aboard.

One of the squadron's pilots was reputed to cart his personal motorcycle – a Czechoslovak-built 250-cc Jawa – in the bomb bay of his IL-28, strapping it to one of the bomb cassettes. The motorcycle came in handy during off-base deployments. As an aside, the Jawa motorbikes were rightly considered the best the Eastern Bloc had to offer in this field.

As early as 22nd July 1954 the Polish *Beagles* made their first public appearance during an air event when three IL-28s made a low flypast over Katowice in V formation. (Previously, the date and location were reported in error as 20th July at Warsaw-Okęcie airport, now known as Warsaw-Frideryk Chopin International.) After this, the IL-28s were a regular feature of various air events. For example, in early September 1957 a *Beagle* piloted by 15. DLB CO Col. Julian Październior led a flypast at Warsaw-Bemowo airfield, with two pairs of Lim-2s as an escort. It was followed hot on its heels by fifty more *Beagles* in ten five-ship vics; the first group of 25 was led by 7. PLB CO Maj. Jerzy Wójcik, the second group by

33. PLB CO Maj. Jerzy Adamiec. An impressive air display was staged on 22nd July 1959 to celebrate the 15th birthday of the People's Republic of Poland, featuring a 16-ship diamond formation of IL-28s followed by 20 more bombers in four-ship diamonds. However, this was overshadowed by the ensuing flypast of an enormous 64-ship formation of fighters!

The 15. DLB put up a similar 16-ship formation of IL-28s on 15th July 1960 during the celebrations of the 550th anniversary of the Battle of Grünwald. The Polish-Lithuanian victory in this decisive battle of the Polish-Lithuanian-Teutonic War (1409-11) is a matter of national pride.

The most striking demonstration of the *Beagle*, however, came at the grand military parade in Warsaw on 22nd July 1966 commemorating the millennium of Polish statehood. Until the 1970s it was quite common to 'sky-write' by flying in special formations, and messages like 'Peace' or '50 years of something-or-other' made up of aircraft were almost obligatory at Eastern Bloc air events. Yet the Poles went the others one better; instead of simply sky-writing '1000' they created the White Eagle – the Polish national symbol – out of no fewer than 33 IL-28s. Nine of these flew in line astern formation to form the eagle's 'body and head'; the 'wings' were each composed of five pairs of aircraft arranged in echelon starboard formation on the left and echelon port formation on the right (the individual pairs flew in echelon port formation on the left and echelon starboard formation on the right), while the remaining four bombers formed the 'tail feathers' in echelon port/echelon starboard pairs. The entire 'bird' measured 340 m (1,115 ft) in length and 300 m (980 ft) across.

The impressive 'eagle' formation was led by Jerzy Wójcik, who had been promoted to lieutenant-colonel and CO of the 7. BLB by 1964. The 'eagle' was preceded by IL-28R '69 Red' piloted by 33. PLRO CO Lt.-Col. Jerzy Adamiec, with four PZL TS-11 Iskra trainers as an escort, and followed by 42 Lim-5 fighters forming the numerals '1000' and sixteen more TS-11s in a close-formation diamond, eight of which were painted white and the others red to represent the Polish *szachownicy* (checkerboard, pronounced '*shahov**nit**sy*') national insignia. The GRO played an important role during such close-formation show performances, constantly informing the pilot of the distance to the wingmen, which he measured by means of the rangefinder built into the ASP-3P computing gunsight.

It may be mentioned that an attempt was made to repeat the performance on 22nd July 1969 during the People's Republic of Poland's silver jubilee celebration, albeit with a smaller eagle because not enough aircraft were available. Eventually, however, the IL-28s' participation in the parade was cancelled due to bad weather.

Meanwhile, the *Beagles* were starting to show their age, and no successor was in sight. In 1973 the high-time IL-28 bombers were retired and, for want of a replacement, the 7. BLRB's bomber squadron was disbanded. Thus the brigade changed its name to 7. BLRO (*brygada lotnicza rozpoznania operacyjnego* – 7th Operational Reconnaissance Brigade), operating 15 IL-28s *sans suffixe*, ten IL-28Es and five IL-28Rs.

Eventually the PWL selected the Sukhoi Su-20 *Fitter-C* supersonic fighter-bomber as a successor to the IL-28. Deliveries to the 7. BLRO began in 1975; consequently on 27th July 1976 the brigade was redesignated 7. BLBR (*brygada lotnictwa bombowo-rozpoznawczego* – 7th Bomber & Reconnaissance Brigade), reflecting the change of priorities. Its last *Beagles* were retired on 29th December 1977 after a farewell ceremony. Still, this was not yet the end; the naval IL-28Rs soldiered on until 23rd December 1978 and the target tugs until 3rd October 1979. That day four IL-28s made the last flights in Polish service, being ferried from the auxiliary airfield of Pieniężnica (pronounced '*Penenzh**nit**sa*') to Nadarzyce AB (pronounced '*Nada**zhit**se*') to become ground targets at the nearby 21st Central Aviation Target Range. After retiring its IL-28s the 19. LEH replaced them with four Yakovlev Yak-40 *Codling* three-turbofan short-haul airliners converted to target tugs by WZL-3 in Radom.

As mentioned in Chapter 4, one *Beagle* was used by the Aviation Institute as the IL-28H engine testbed. Later the same aircraft served as a 'mother ship' for a Polish supersonic aerial target.

The IL-28 contributed a lot to the progress of skydiving in Poland. On 4th September 1957 the parachutist Tadeusz Dulla made a jump from an IL-28 flying at 12,500 m (41,010 ft), though some reports state the altitude as 11,900 m (39,040 ft). Either way, he set a national record that was just a little short of the world record established by the Czech trio earlier that year. Later, other Polish skydivers made single and group jumps from IL-28s in similar fashion.

In the course of six years (1952-57) a total of 98 IL-28s were delivered new to Poland – 73 bombers, nine IL-28Rs and 16 IL-28Us were purchased. In 1965 these were augmented by a second-hand IL-28 from Czechoslovakia (as compensation for a Polish *Beagle* that was accidentally rammed and destroyed by a CzAF fighter), bringing the total to 99.

Known Polish Air Force IL-28s are listed on pages 319-322. Unfortunately, while all construction numbers are known, information on the serial-to-c/n tie-ups is very incomplete. In fact, no fewer than 110 c/ns have been reported for Polish Air Force IL-28s! While some of the eleven superfluous numbers are easy to identify (because of batch number/aircraft number duplication with others in the list), others are not.

A rare colour photo of an operational Polish Air Force IL-28. '41 Yellow' was one of the few examples to have a yellow serial.

Known Polish Air Force IL-28s

Serial	Version	C/n	Notes
1 Red	IL-28	2402102	Voronezh-built, mfd 12-1952; 33. PLB, apparently to Navy/15. SELR in 1956
2 Red	IL-28	?	ITWL, brake parachute testbed
3 Red	IL-28	?	Navy, 15. SELR
4 Red	IL-28	2401910	Mfd 10-1952. 33. PLB, apparently to Navy/15. SELR in 1956. To *Muzeum Wyzwolenia Miasta Poznania* (Poznań City Liberation Museum)* in 1982
5 Red	IL-28	3402210	Mfd 1-1953; 7. PLB, later 33. PLB; apparently to Navy/15. SELR in 1956
6 Red	IL-28	?	Navy, 15. SELR
7 Red (1)	IL-28	56203	Moscow-built, full c/n 54006203. Mfd 8-1954; 7. PLB, later 33. PLB; apparently to Navy/ 15. SELR in 1956. Scrapped
7 Red (2)		3402207	Mfd 1-1953; 7. PLB. Preserved *Parco Tematico dell' Aviazione*, Cerbaiola, Italy; serial may be fake!
8 Red	IL-28	2402103	Mfd 12-1952; 15. DLB; apparently to Navy/15. SELR in 1956. Crashed 15-6-1966
9 Red	IL-28	?	Navy, 15. SELR
01 Red	IL-28R	41903	Irkutsk-built, mfd 1955; Navy, 15. SELR. Crashed Siemirowice AB 1959 (broke up in mid-air when the pilot exceeded the G limit), crew killed
02 Red	IL-28R	41908	D/D reported as 20-5-1955 but doubtful; 21. PLZ, 21. SPLR, later 33. PLRO. To Navy, 15. SELR. C/n also reported as 41906!
03 Red	IL-28R	41905	Mfd 1955; D/D 21-3-1956, 21. SPLR. To Navy, 15. SELR. C/n reported in error as 2905
09 Red	IL-28	?	
10 Red	IL-28	?	Preserved Witkowo town centre; reported as IL-28RE!
11 Red	IL-28	2402002	7.PLB, c/n painted on as 2002; to 7. BLB, to 7. BLRB. Crashed 5-2-1973; SOC 3-9-1973
12 Red		3402209	Mfd 1-1953; 7. PLB
17 Red	IL-28	3402306	Mfd 1-1953; 33. PLB
20 Red (1)	IL-28	2402006	Mfd 10-1952; 15. DLB. Crashed 31-8-1966
20 Red (2)	IL-28	52517	Irkutsk-built, mfd 12-1956; 7. PLB
22 Red (1)	IL-28	2402113	Mfd 12-1952; 7. PLB, later 33. PLB. Became, see next line
64 Red			Wfu 1977. To *Muzeum Oręża Polskiego* (Polish Arms Museum), Kołobrzeg, 13-3-1978; now with fake serial '52 Red'
22 Red (2)?	IL-28	2402115	Mfd 12-1952; 33. PLB. Reported as such but may be a mistaken report for 2402113
23 Red	IL-28	?	
30 Red	IL-28R	41302	D/D 20-5-1955; 21. PLZ, later 21. SPLR. Became, see next line
32 Red (2)			
32 Red (1)	IL-28	?	
33 Red	IL-28	56207	Moscow-built, full c/n 54006207. Mfd 8-1954. 33. PLB, later 7. PLB
34 Red	IL-28	2402004	Mfd 10-1952; 15. DLB, later 21. SPLR. Crashed 27-2-1963
35 Red	IL-28	?	
39 Red	IL-28	?	

40 Red	IL-28	56219	Moscow-built, full c/n 54006219. Mfd 8-1954; 35. PLB, later 7. BLB. Crashed near Prague 10-4-1964 (not 16-4-1964 as sometimes reported!) after colliding with CzAF MiG-19PM; pilot OK, navigator and GRO killed
41 Yellow	IL-28	56729	Moscow-built, full c/n 55006729. Mfd 5-1955, D/D 14-6-1955, 35. PLB. Became, see next line
22 Red (2)			Preserved *Muzeum Wojska Polskiego* (Polish Armed Forces Museum), Warsaw (aka *Muzeum Katyńskie*), later with fake serial '65 Red'
42 Red	IL-28	?	C/n reported as 56203 but see '7 Red' above! 7. BLB. Converted to target tug, to 19. LEH
43 Red	IL-28	2402008	Mfd 10-1952; 33. PLB
44 Red	IL-28	?	
45 Red	IL-28R	41309	D/D 20-5-1955; 21. PLZ, later 21. SPLR, then 33. PLRO. Became, see next line
71 Red			
46 Red	IL-28R	41307	D/D 20-5-1955; 21. PLZ, later 21. SPLR, then 33. PLRO
47 Red	IL-28	2402010	Mfd 10-1952; 7. PLB. Preserved Łodź-Lublinek airport without insignia
50 Red	IL-28	56538	Moscow-built, full c/n 55006538. Mfd 18-2-1955, D/D 7-4-1955; 15. PLB, later 7. PLB, still later converted to target tug but operated by 7. BLBR. To *Muzeum Braterstwa Broni* (Comradeship-in-Arms Museum), Drzonów near Zielona Góra, 18-6-1979 †
51 Red	IL-28	?	33. PLB; c/n reported as 56606210!
52 Red	IL-28	?	
53 Red	IL-28	?	
54 Red	IL-28	?	
55 Red	IL-28	56701	Moscow-built, full c/n 55006701. Mfd 5-1955, D/D 14-6-1955; 35. PLB
57 Red	IL-28	52308	Irkutsk-built, mfd 1956
58 Red	IL-28	?	
59 Red	IL-28	?	
60 Red	IL-28	56735	Moscow-built, full c/n 55006735. Mfd 5-1955, D/D 14-6-1955; 35. PLB. Crashed 14-1-1969
62 Red	IL-28	?	
63 Red	IL-28	?	
65 Red	IL-28	3402212	Mfd 1-1953; 33. PLB. Converted to, see next line
	IL-28E		33. PLRO. Preserved OSL, Dęblin-Irena
68 Red	IL-28R	?	
69 Red	IL-28R	41302	Mfd 1955, D/D 20-5-1955; 33. PLRO. Later to Navy/15. SELR as a replacement for 01 Red. Preserved *Muzeum Marynarki Wojennej* (Navy Museum), Gdynia
72 Red	IL-28R	41909	D/D 21-3-1956, 21. SPLR. To *Muzeum Lotnictwa i Astronautyki* (MLiA – Aerospace Museum), Kraków; 6-7-1978
75 Yellow	IL-28	?	
001 Red	IL-28	?	ITWL, brake parachute testbed
021 Red	IL-28	?	
030 Red	IL-28R	41907	Mfd 1955; D/D 21-3-1956, 21. SPLR, later 33. PLRO
101 Red	IL-28	?	
102 Red		52510	Irkutsk-built, mfd 12-1956; 33. PLB
111 Red	IL-28	?	
113 Red	IL-28	2402108	Mfd 12-1952; 33. PLB, later 7. PLB
115 Red	IL-28	2402119	Mfd 12-1952; 33. PLB, later 7. PLB; also reported as 10 Red!
119 Blue	IL-28	?	Converted to, see next line
	IL-28H		*Instytut Lotnictwa*, engine testbed and UAV mother ship
122 Red	IL-28	?	
123 Red	IL-28	?	
125 Red	IL-28	56721	Moscow-built, full c/n 55006721. Mfd 5-1955, D/D 14-6-1955; 35. PLB. Crashed 6-6-1975
126 Red	IL-28	?	Converted to, see next line
	IL-28E		33. PLRO
133 Red	IL-28	?	Converted to, see next line
	IL-28E		33. PLRO. Preserved Łodź-Lublinek
U1 Red	IL-28U	64204	Full c/n 62004204. 33.PLB; D/D 11-12-1952, first IL-28U delivered to Poland. To Navy/15. SELR 1956. Probably became, see next line
S1 Red?	IL-28U		Crashed Siemirowice AB 1958 when undershot on landing in poor weather, crew killed
U2 Red	IL-28U	64108?	Full c/n 62004108? D/D 1952. Probably became, see next line
S2 Red?			Existence not proven but likely
U3 Red	IL-28U	610004	Full c/n 65010004
S3 Red (1)	IL-28U	67612	Full c/n 64007612; mfd 7-1954, D/D 14-7-1954. Preserved CSSTWL Oleśnica ‡
S3 Red (2)	IL-28U	69216	Full c/n 65009216; 33. PLB, transferred to Navy/15. SELR 1958 as a replacement for S1 Red. Stored Siemirowice AB; last flight 19-6-1979 to Kraków, preserved MLiA

S4 Red	IL-28U	67614	Full c/n 64007614; mfd 9-1954, D/D 14-7-1954
S5 Red	IL-28U	?	
S6 Red	IL-28U	?	Converted to target tug, to 19. LEH
?	IL-28	56175	Moscow-built, full c/n 54006175
?	IL-28	56179	Moscow-built, full c/n 54006179. 7. PLB, later 33. PLB
?	IL-28	56204	Moscow-built, full c/n 54006204. Mfd 8-1954; 7. PLB, later 33. PLB
?	IL-28	56205	Moscow-built, full c/n 54006205. Mfd 8-1954; 7. PLB. Returned to the Soviet Union 2-1966
?	IL-28	56206	Moscow-built, full c/n 54006206. Mfd 8-1954; 33. PLB, later OSL-4
?	IL-28	56209	Moscow-built, full c/n 54006209. Mfd 8-1954; 7. PLB, later 33. PLB; also reported as c/n 56606209 (Omsk-built)!
?	IL-28	56211	Moscow-built, full c/n 54006211. Mfd 8-1954; 7. PLB; also reported as c/n 56606211 (Omsk-built)!
?	IL-28	56213	Moscow-built, full c/n 54006213. Mfd 8-1954; 7. PLB; also reported as c/n 56606213 (Omsk-built) and 35. PLB!
?	IL-28	56215	Moscow-built, full c/n 54006215. Mfd 8-1954; 33. PLB, later 7. PLB
?	IL-28	56217	Moscow-built, full c/n 54006217. Mfd 8-1954; 33. PLB, later 7. PLB
?	IL-28	56221	Moscow-built, full c/n 54006221. Mfd 8-1954; 7. PLB
?	IL-28	56222	Moscow-built, full c/n 54006222. Mfd 8-1954; 15. DLB
?	IL-28	56225	Moscow-built, full c/n 54006225. Mfd 8-1954; 7. PLB
?	IL-28	56710	Moscow-built, full c/n 55006710. Mfd 5-1955, D/D 14-6-1955; 35. PLB
?	IL-28	56716	Moscow-built, full c/n 55006716. Mfd 5-1955, D/D 14-6-1955; 35. PLB
?	IL-28U	67613	Full c/n 64007613. Mfd 9-1954, D/D 14-7-1954; 7.PLB
?	IL-28U	67615	Full c/n 64007615. Mfd 9-1954, D/D 14-7-1954; 33. PLB
?	IL-28U	68611	Full c/n 64008611. Mfd 10-1954, D/D 10-11-1954; 33. PLB
?	IL-28U	68612	Full c/n 64008612. Mfd 10-1954, D/D 10-11-1954; 35. PLB
?	IL-28U	68613	Full c/n 64008613. Mfd 10-1954, D/D 10-11-1954; 33. PLB
?	IL-28U	68614	Full c/n 64008614. Mfd 10-1954, D/D 10-11-1954; 7.PLB
?	IL-28U	69020	Full c/n 64009020
?	IL-28U	69215	Full c/n 65009215. 35. PLB
?	IL-28U	69611	Full c/n 65009611. 33. PLB
?	IL-28U	610005	Full c/n 65010005. 33. PLB
?	IL-28U	610006	Full c/n 65010006. D/D 7-4-1955; 33. PLB
?	IL-28U	610007	Full c/n 65010007. D/D 7-4-1955; 7.PLB
?	IL-28U	610020	Full c/n 65010020. D/D 7-4-1955; 7.PLB
?	IL-28	2401908	Mfd 10-1952; 15. DLB. Crashed 1-2-1954
?	IL-28	2402104	Mfd 12-1952; 7. PLB
?	IL-28	2402105	Mfd 10-1952; 7. PLB
?	IL-28	2402106	Mfd 12-1952; 7. PLB
?	IL-28	2402107	Mfd 12-1952; 7. PLB
?	IL-28	2402109	Mfd 12-1952; 7. PLB, later 33. PLB
?	IL-28	2402111	Mfd 12-1952; 33. PLB
?	IL-28	2402112	Mfd 12-1952; 33. PLB
?	IL-28	2402114	Mfd 12-1952; 7. PLB
?	IL-28	2402116	Mfd 12-1952; 7. PLB
?	IL-28	2402117	Mfd 12-1952; 33. PLB, later 7. PLB. Crashed 4-4-1967
?	IL-28	2402118	Mfd 12-1952; 7. PLB
?	IL-28	2402120	Mfd 12-1952; 33. PLB
?	IL-28	2402201	Mfd 12-1952; 33. PLB
?	IL-28	3402202	Mfd 1-1953; 33. PLB
?	IL-28	3402203	Mfd 1-1953; 33. PLB
?	IL-28	3402204	Mfd 1-1953; 7. PLB
?	IL-28	3402205	Mfd 1-1953; 7. PLB
?	IL-28	3402206	Mfd 1-1953; 7. PLB
?	IL-28	3402208	Mfd 1-1953; 33. PLB
?	IL-28	3402211	Mfd 1-1953; 7. PLB
?	IL-28	3402214	Mfd 1-1953; 33. PLB
?	IL-28	3402216	Mfd 1-1953; 33. PLB. Crashed 17-5-1969
?	IL-28	56606212?	35.PLB; existence doubtful!
?	IL-28R	41906	Mfd 1955; D/D 21-3-1956, 21. SPLR. Reported by some sources as 02 Red and transferred to Navy/15. SELR, see this serial!

?	IL-28	52109	Irkutsk-built, mfd 9-1956; 7. PLB. C/n reported in error as 56652109 (Omsk-built)! Ex-CzAF 2109, D/D 6-12-1965 as compensation for loss of IL-28 '40 Red'
?	IL-28	52317	Irkutsk-built, mfd 1956
?	IL-28	52409	Irkutsk-built, mfd 12-1956; 7. PLB
?	IL-28	52419	Irkutsk-built, mfd 12-1956; 33. PLB
?	IL-28	52420	Irkutsk-built, mfd 12-1956; 7. PLB. Crashed 18-12-1961
?	IL-28	52509	Irkutsk-built, mfd 12-1956; 15. BLB
?	IL-28	52511	Irkutsk-built, mfd 12-1956; 35. PLB
?	IL-28	52512	Irkutsk-built, mfd 12-1956; 35. PLB
?	IL-28	52518	Irkutsk-built, mfd 12-1956; 35. PLB
?	IL-28	52601	Irkutsk-built, mfd 12-1956; 33. PLB
?	IL-28	52602	Irkutsk-built, mfd 12-1956; 33. PLB
?	IL-28	52603	Irkutsk-built, mfd 12-1956; 33. PLB

* Aka *Muzeum Cytadeli Poznańskiej* (Poznań Fortress Museum)
† Now called *Muzeum Ziemi Lubuskiej* (Lubusz Region Museum).
‡ CSSTWL = *Centrum szkolenia specjalistów technicznych Wojsk lotniczych* – Air Force Technical Staff Training School

Romania

The **Romanian Air Force** (then known as FA-RSR – *Forţele Aeriene ale Republicii Socialiste Române*) ordered the IL-28 in 1954 and the type was introduced in March 1955 when the *Regimentul* 282 *Aviaţie Bombardament* (282nd Bomber Regiment) at Ianca AB located 40 km (25 miles) south-west of Galaţi took delivery of the first three aircraft – two Irkutsk-built bombers (referred to locally as IL-28Bs) and one IL-28U. (Some sources claim that the first lot consisted of three trainers and two bombers.) Soon afterwards the unit moved to Mihail Kogălniceanu AB. Interestingly, the aircraft were delivered in Soviet markings; the Romanian insignia were applied on site.

Conversion training of Romanian crews began on 15th April. As it often did, the Soviet Union sent a team of instructors to assist in mastering the IL-28 and train the customer's personnel *in situ*; it remained with the unit until 5th May 1955, when the Soviet units stationed in Romania after the war were withdrawn. Immediately afterwards, in June 1955, the 282nd Bomber Regiment relocated to Otopeni (now Bucharest's international airport, aka Bucharest-Henri Coandă International). The reason for the move was that by then the base had long concrete runways and a well-developed infrastructure. For want of Soviet instructors the five Romanian crews who had got their IL-28 type ratings had to act as instructors for the other airmen.

Romanian Air Force IL-28 '433 Red' at Cocargeaua AB in 1964.

Opposite page: A Romanian IL-28R, '405 Red', about to depart on a sortie.

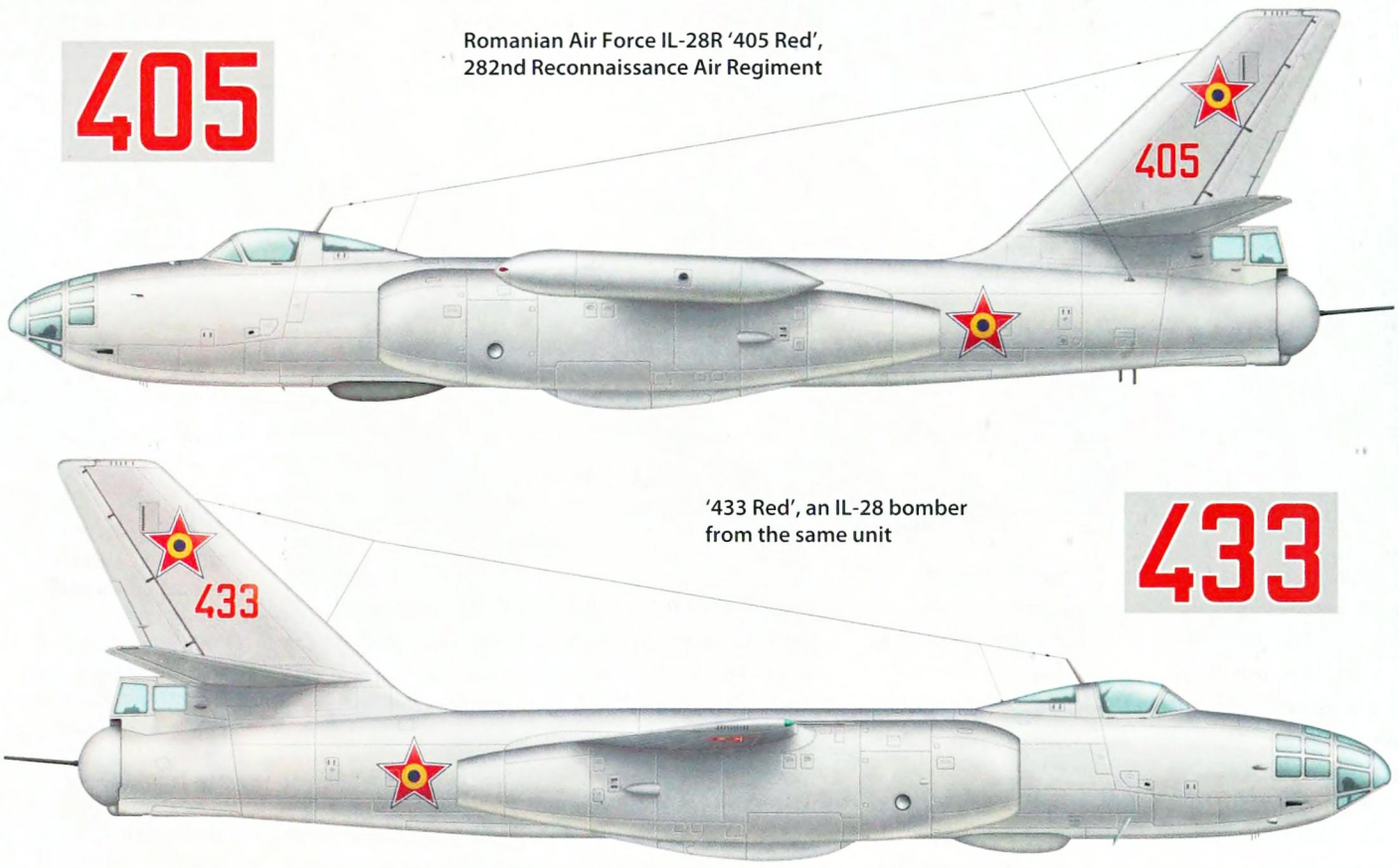
Below left: The instructor pilot of an IL-28U watches from the front cockpit as a ground crewman holds the ladder for the trainee climbing out while another cadet waits his turn for the 'joyride'.

Below: Maj. Constantin Bujor beside his IL-28 '015 Red'.

A total of 14 Soviet-built IL-28s – the above-mentioned two bombers, six IL-28Rs (again Irkutsk-built) and six IL-28Us – were delivered to Romania in 1955-56. The trainers were initially referred to locally as 'Uil-28', and such entries can be found in pilots' log books. Romanian sources state 'four IL-28Bs and four IL-28Rs', but the c/ns show otherwise – two of the purported IL-28Bs were in fact IL-28Rs as well.

In 1956 the unit was redesignated as *Regimentul* 282 *Aviație Cercetare* (282nd Reconnaissance Regiment). The latter was logical enough, considering that most of its aircraft were IL-28Rs. (Incidentally, some sources suggest the reconnaissance version was known locally as the IL-28C, the suffix denoting *cercetare* – 'to search'.) On 20th June 1957 the unit flew its first nocturnal sortie.

In addition to participating in Romanian military exercises in their main bomber and reconnaissance roles, the IL-28s often acted as practice targets for Romanian fighter pilots making simulated attacks, operating in the interests of the Territorial Air Defence



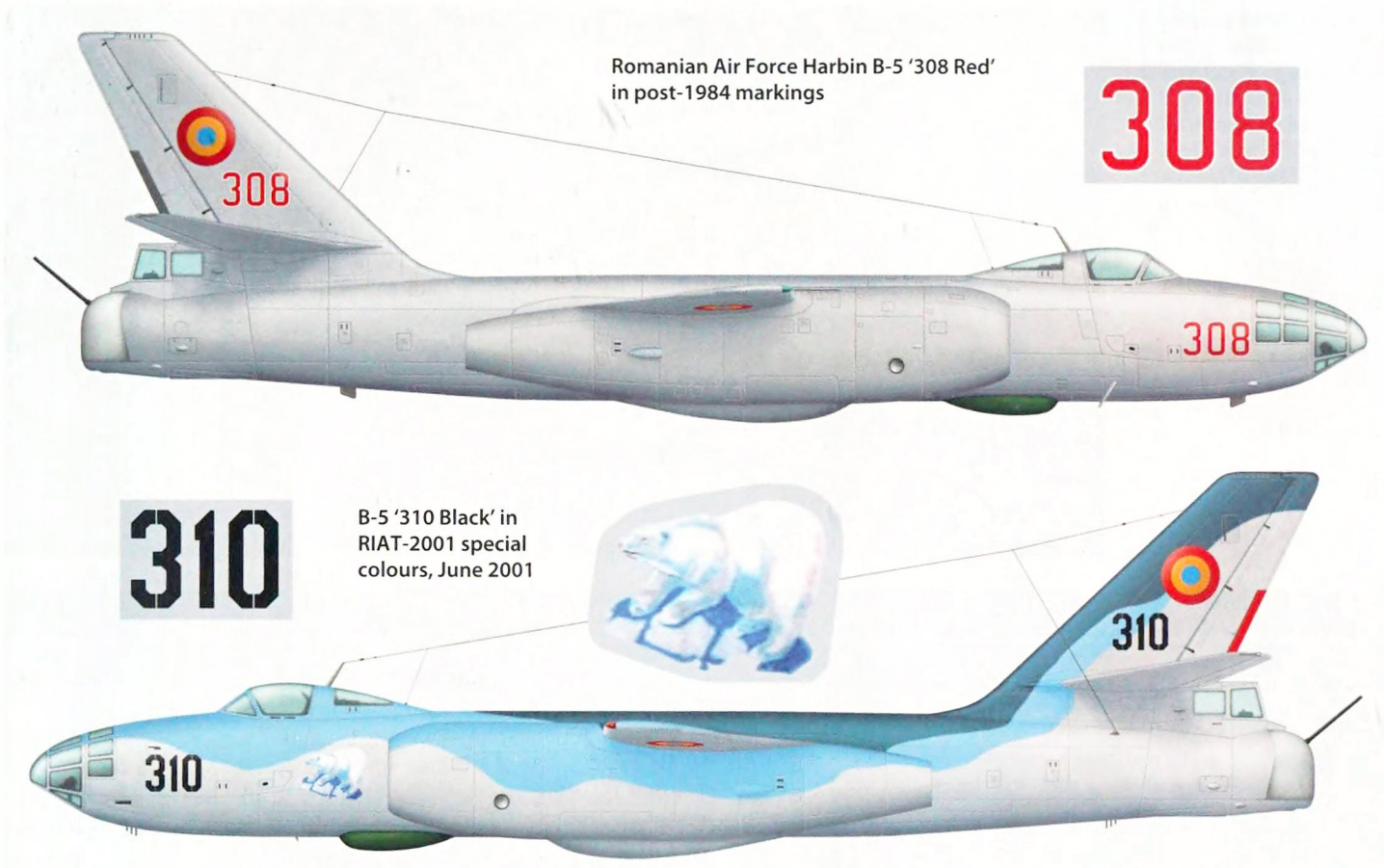
Romanian Air Force IL-28R '405 Red', 282nd Reconnaissance Air Regiment

'433 Red', an IL-28 bomber from the same unit

Command (CAAT – *Comandamentul Apărării Antiaeriene a Teritoriului*). Another regular task was to check the operation of the CAAT's air defence radars, emulating hostile bombers. During the Hungarian uprising in October 1956 the 282nd Regiment was placed on heightened alert, and its IL-28Rs flew a number of reconnaissance missions over Hungary.

One of the more unusual tasks performed by the Romanian IL-28s was the jamming of hostile western propaganda broadcasts aimed at gullible listeners in the

Maj. Constantin Bujor prepares to fly a sortie in an IL-28RTR ELINT aircraft.



Romanian Air Force Harbin B-5 '308 Red' in post-1984 markings

B-5 '310 Black' in RIAT-2001 special colours, June 2001

Eastern Bloc. To this end two of the *Beagles* were fitted out with ECM equipment. These efforts were not entirely successful, as people in Romania could still occasionally listen to the subversive broadcasts of Radio Free Europe.

In 1957 the unit moved yet again, taking up residence at Boteni AB near Bucharest. Boteni was a disadvantageous location in that it lacked an air traffic control radar and was located close to a major air route used by commercial aircraft, which meant an ever-present danger of a mid-air collision. There were several near-misses but the skill of the pilots, together with a good deal of luck, saved the day.

On 19th April 1958 one of the IL-28Rs flew a special mission to film a total eclipse of the Sun; the aircraft was flown by pilot Lt.-Col. Dumitru Enache (one of the first Romanian pilots to master the type) and navigator Capt. Gheorghiu Popescu, with a civilian cameraman in the tail gunner's station. Shortly afterwards, in May 1958 (some sources say in 1960), the regiment was demoted to squadron status due to arms reductions, becoming the *Escadrila* 282 *Aviație Cercetare*, and relocated for the last time, this time to Cocargeaua AB near Borcea (now called Borcea-Fetești AB).

Two of the IL-28Rs (433 Red and 443 Red) were modified for target-towing duties in the 1960s, deploying to Mihail Kogălniceanu AB and Palas AB near Constanța; it is not known whether they corresponded to the Soviet standard or differed from the Soviet model. Target practice with these aircraft took place at the Cap Midia gunnery range.

According to Romanian sources, by 1972 most of the surviving Soviet-built IL-28s had reached the limit of their service lives and had been retired (maybe with the exception of two IL-28Us which remained in service until the late 1980s). To compensate for this, in 1971

The port wingtip pod of a Romanian IL-28 modified for ECM duties.

Showing faded insignia and chipped paintwork, B-5 '308 Red' sits at Bacău, with hardened aircraft shelters for the resident MiG-21s in the background.

Known Romanian Air Force IL-28s

Serial	Version	C/n	Notes
001 Red	IL-28U	610001	Full c/n 65010001. D/D 1955. SOC and scrapped
002 Red	IL-28U	610002	Full c/n 65010002. D/D 1955. SOC and scrapped
003 Red	IL-28U	610003	Full c/n 65010003. D/D 1955. SOC and scrapped
014 Red	IL-28	52014	Irkutsk-built, D/D 1955 or 1956. Crashed, details unknown
015 Red	IL-28	52015	Irkutsk-built, D/D 1955 or 1956. DBR, details unknown
018 Red	IL-28U	610018	Full c/n 65010018. D/D 1955. SOC and scrapped
062 Red	IL-28U	610062	Full c/n 65010062. D/D 1955. SOC and scrapped
125 Red?	?	?	Existence not confirmed
301 Red?	B-5	?	Existence not confirmed
307 Red	B-5	511710307	D/D 19-1-1972. Target tug conversion. Crashed on landing Borcea-Fetești AB 2-8-2000
308 Red	B-5	511710308	D/D 19-1-1972. Grey overall. SOC and stored Bacău AB, later scrapped
309 Red	B-5	511710309	D/D 19-1-1972. Grey overall. SOC and scrapped
310 Red	B-5	511710310	D/D 19-1-1972. Became, see next line
310 Black			Painted in grey/blue special colours for RIAT-2001 by 7-2001. Crashed on landing Borcea-Fetești AB 21-7-2001
317 Red	IL-28R	41317	SOC and scrapped
402 Red	IL-28R	41402	D/D 1954 or 1955. Preserved *Muzeul Aviației*, Bucharest-Otopeni airport
403 Red	IL-28R	41403	D/D 1954 or 1955. Target tug conversion. Crashed at Bacău AB 1-8-1955, crew killed
405 Red	IL-28R	41405	D/D 1954 or 1955. Preserved *Muzeul Aviației*, Baneasa section; post-1984 roundels on tail but pre-1984 star insignia on fuselage
407 Red	BT-5	5101407	D/D 18-2-1980. Stored Bacău AB
408 Red	BT-5	5101408	D/D 18-2-1980
433 Red	IL-28R	41433	Referred to in error as an IL-28B. D/D 1954 or 1955, non-standard blade aerial under nose. Target tug conversion. SOC and scrapped
443 Red	IL-28R	41443	Referred to in error as an IL-28B. D/D 1954 or 1955. Target tug conversion. SOC and scrapped
462 Red?	B-5	?	Existence not confirmed
491 Red?	B-5	?	Existence not confirmed
501 Red	IL-28U	69501	Full c/n 65009501. D/D 1955. SOC and scrapped
543 Red?	B-5	?	Existence not confirmed
701 Red	B-5	573190701	D/D 15-10-1975. Crashed 5-1991
703 Red	B-5	573190703	D/D 15-10-1975. SOC and stored Bacău AB, later scrapped
704 Red	B-5R	573190704	D/D 15-10-1975. SOC and scrapped
706 Red	B-5	573190706	D/D 15-10-1975. SOC and stored Bacău AB, later scrapped
707 Red	B-5	573190707	D/D 15-10-1975. Stored Borcea-Fetești AB
708 Red	B-5	573190708	D/D 15-10-1975. SOC and scrapped
709 Red	B-5	573190709	D/D 15-10-1975. SOC and scrapped
710 Red	B-5	573190710	D/D 15-10-1975. Crashed Bacău AB in 1985 during post-overhaul test flight

Romania ordered Chinese copies of the IL-28 and IL-28U; this time the proportion between variants was rather different – 12 Harbin B-5 bombers (delivered in two batches in 1972 and 1975) and two BT-5 trainers delivered in 1980. One of the B-5s, 307 Red, was likewise converted for target-towing duties. Thus, the total number of *Beagles* and *Mascots* confirmed as delivered to Romania is 28; several other aircraft have been reported but their existence is open to doubt.

In due course the 282nd Sqn was renumbered, becoming *Escadrila* 38 *Aviație Cercetare*. After the first overhaul the original natural metal finish of the B-5s gave way to an overall light grey colour scheme (except for the tail turret, which was white). In 1984 the Romanian Air Force introduced new national insignia – red/yellow/blue roundels replacing the original red pentastars with a yellow/blue centre.

The *Beagle* was quite popular with its crews. The Romanian airmen dubbed the IL-28 *Blândul Ben* (Gentle Ben) after a good-natured bear in a Romanian TV series, the nickname reflecting the aircraft's easy and forgiving handling.

Right away the Romanians decided to handle the IL-28 repair and overhaul jobs on their own. As early as the spring of 1954, before the first *Beagles* were delivered, the so-called *Secția ZZ* (ZZ Department; the letters were simply a code to confuse outsiders) had been set up at the URA Bacău aircraft overhaul plant. This department took care of all jet hardware of the Romanian Air Force, including the IL-28 and its VK-1A engines. Starting in 1961, the Romanian *Beagles*, including the Chinese-built ones, were refurbished at URA Bacău (subsequently IAv Bacău).

A minor sensation (and a major treat for warbird enthusiasts) was planned for 27th-29th July 2001 when the Romanian Air Force – now known as FAR, *Forțele Aeriene Române* – was to participate in the 30th Royal International Air Tattoo at RAF Cottesmore, Rutland, with a B-5, making the type's first-ever visit to the West. The chosen aircraft (310 Black) even received a special colour scheme for the occasion. Unfortunately these plans were dashed to the ground (literally) just a few days before the show when '310 Black' crash-landed during a training flight on 21st July, losing its entire starboard wing. Since all other surviving B-5s were non-airworthy at that moment (or in less than showcase condition anyway) and could not be made flyable in time for the airshow, the trip had to be cancelled.

The type made a farewell public appearance in 2001, when BT-5 '408 Red' was displayed statically at the Romanian International Air Show (RoIAS'2001) held at Mihail Kogălniceanu AB on 25th-26th August. Shortly afterwards the Romanian Air Force finally retired the IL-28, being the last European air arm to operate it, and the 38th Sqn was stood down.

Somalia

In the late 1960s the **Somalian Aeronautical Corps** (*Dayuuradaha Xoogga Dalka Somaliyeed*) reportedly operated ten IL-28s. Unfortunately no details are known.

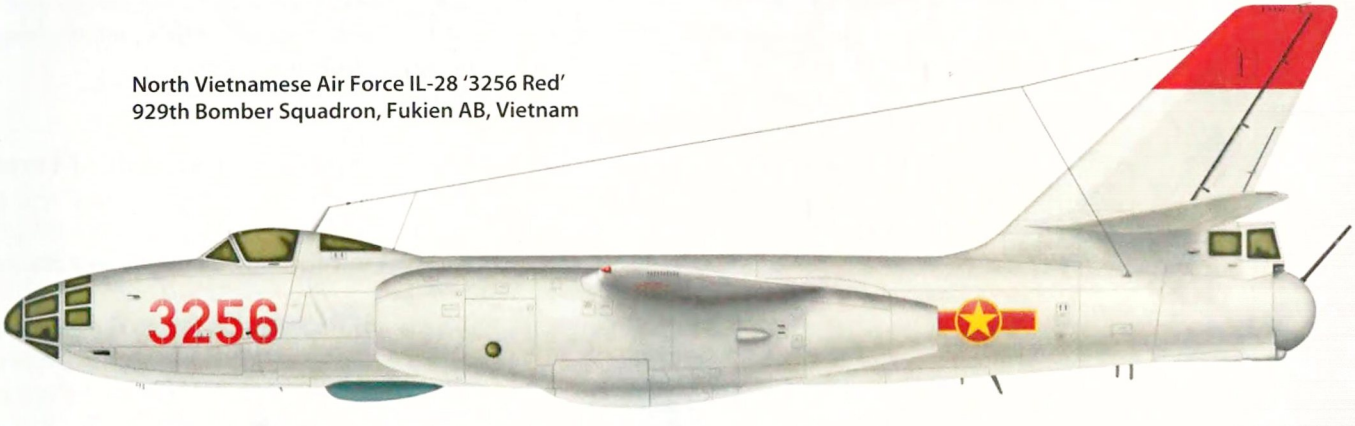
Syria

The **Syrian Arab Air Force** (SyAAF, or *al Quwwat al-Jawwiya al-Arabiya as-Suriya*) retained only six of the UARAF *Beagles*, including a few IL-28Rs, when the United Arab Republic was again divided into Egypt and Syria. They were the SyAAF's first specialised strike aircraft. The IL-28s served with No.819 Sqn at Tiyas AB (also referred to in western sources as T4 airbase).

Two of the *Beagles* were destroyed at al-Mezze AB by an Israeli air raid on 5th June 1967, the first day of the Six-Day War. The remaining four were used with some success for nocturnal reconnaissance missions over Israel in the inter-war period. Unfortunately no serials are known.

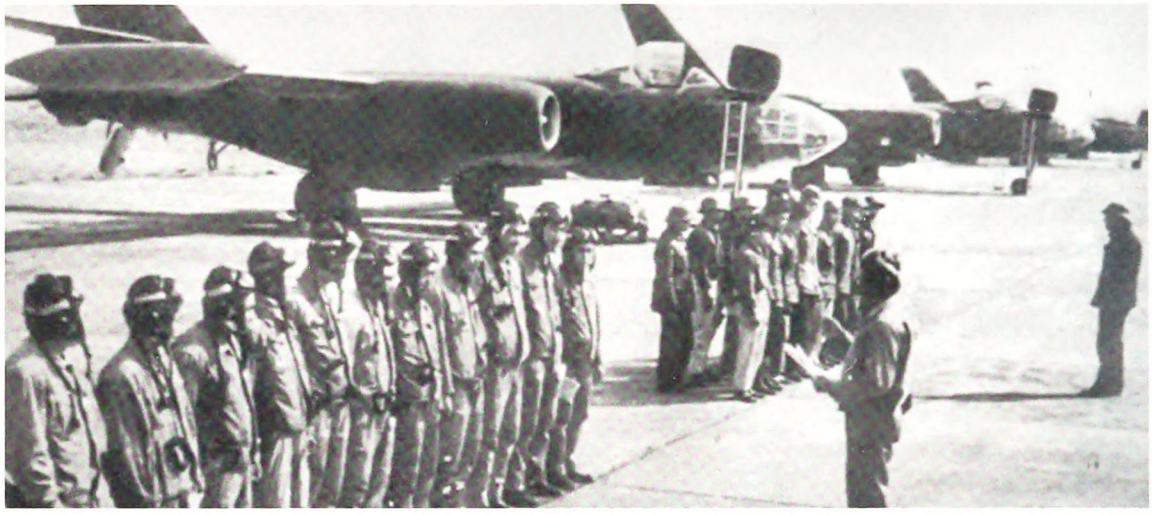
Vietnam (North Vietnam)

Having established fairly close ties with North Vietnam in the mid-1960s, Communist China started foisting its obsolete military aircraft on the Vietnamese. These included 12 Soviet-built IL-28 bombers delivered to the



North Vietnamese Air Force IL-28 '3256 Red'
929th Bomber Squadron, Fukien AB, Vietnam

Right: The camouflaged IL-28s of the North Vietnamese Air Force's 929th Bomber Squadron on the flight line at Noi Bái AB. The nearest aircraft is one of the unit's two IL-28Rs.



Below: 929th Squadron pilots pose with one of the IL-28s.

Below right: A publicity photo showing a Vietnamese IL-28 crew preparing for a sortie.

Known North Vietnamese Air Force/Vietnamese People's Air Force IL-28s

Serial	Version	C/n	Notes
1817 Red	IL-28	?	Natural metal finish
2180 Red	IL-28	?	Natural metal finish
2210 Red	IL-28	?	Light green/dark green/brown camouflage in narrow stripes
3256 Red	IL-28	?	Natural metal finish, red fin tip

North Vietnamese Air Force (NVAF) – later known as the **Vietnamese People's Air Force** (VPAF, or *Không Quan Nham Dan Viêt Nam*) – in early 1965. More specifically, these were eight IL-28 bombers, two IL-28R reconnaissance aircraft and two IL-28U trainers – too few for a full regiment, but just enough for a squadron. The aircraft entered service with the newly established 929th Bomber Squadron (*Đai Đôi Không Quân Ném Bom* 929) at Noi Bái AB in May 1965; in October 1968 this was reorganised as the 929th Bomber Battalion (*Tieu Đoàn Không Quân Nem Bom* 929). China served as a training and maintenance base; Vietnamese IL-28s are known to have been repaired at the PLAAF's Mengtse AB in Yunnan Province. Most of the IL-28s were reportedly destroyed on the ground by USAF air strikes.

North Yemen (Yemen Arab Republic)

Established in 1957 as the Royal Yemen Air Force and growing stronger when North Yemen formed a confederation with the United Arab Republic in March 1958, the air arm was renamed the **Yemen Arab Republic Air Force** (YARAF) after the overthrow of the monarchy in 1962. Supported by the UAR (and supplied by the latter's chief ally, the Soviet Union), it began receiving Soviet aircraft.

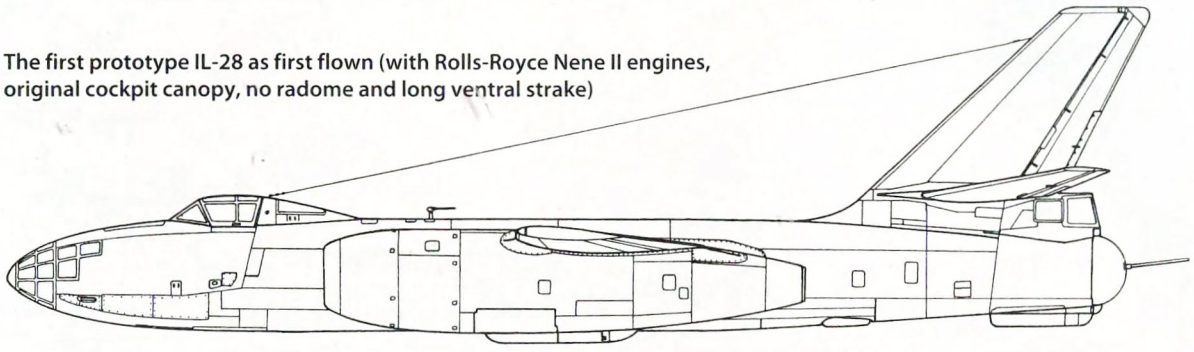
Strike aircraft were initially represented by six IL-28s received via Egypt in the mid-1960s. Unfortunately no serials or base details are known.

South Yemen (People's Democratic Republic of Yemen)

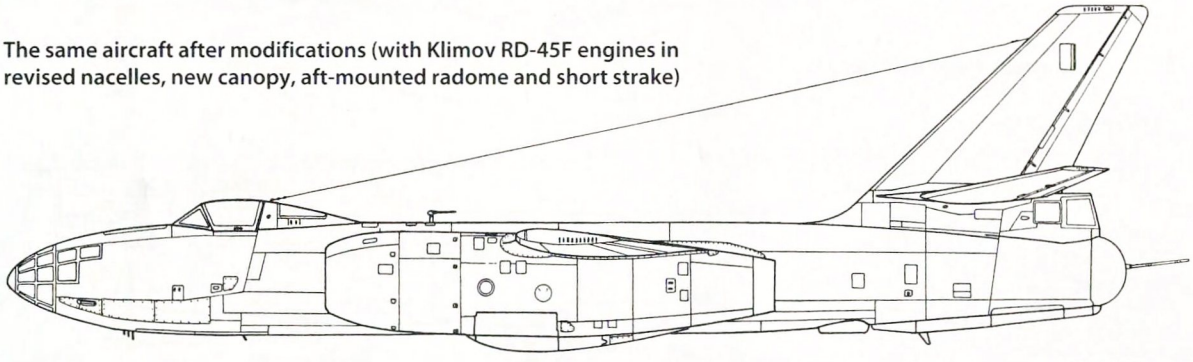
The **South Yemen Air Force** was created shortly after the British withdrawal in 1967. In 1970 this became the **People's Democratic Republic of Yemen Air Force** (PDRYAF).

Like its northern neighbour, South Yemen operated the IL-28 on a small scale in the mid-1960s, receiving 12 of the type. Only one aircraft serialled 81 has been identified so far, sitting derelict at Hodeida.

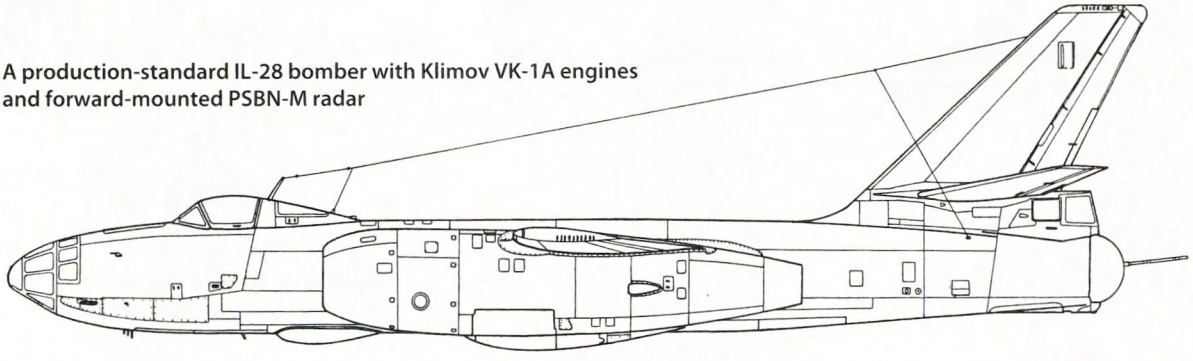
The first prototype IL-28 as first flown (with Rolls-Royce Nene II engines, original cockpit canopy, no radome and long ventral strake)



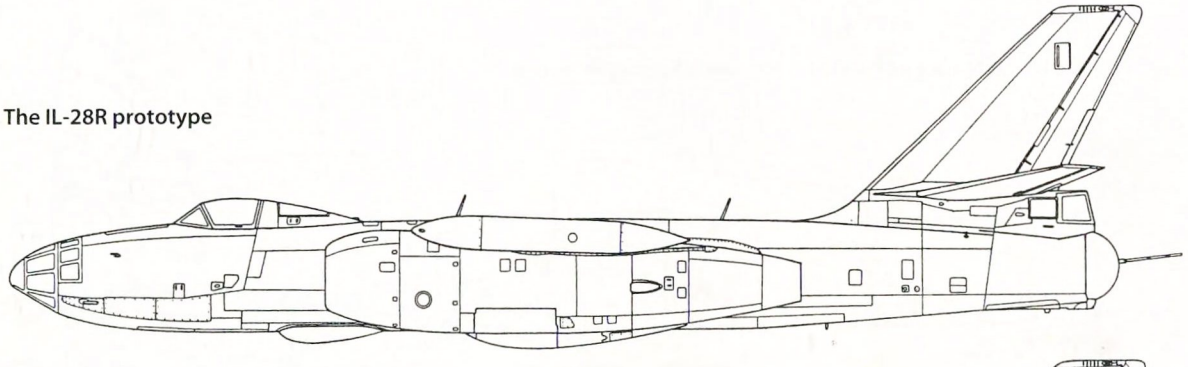
The same aircraft after modifications (with Klimov RD-45F engines in revised nacelles, new canopy, aft-mounted radome and short strake)



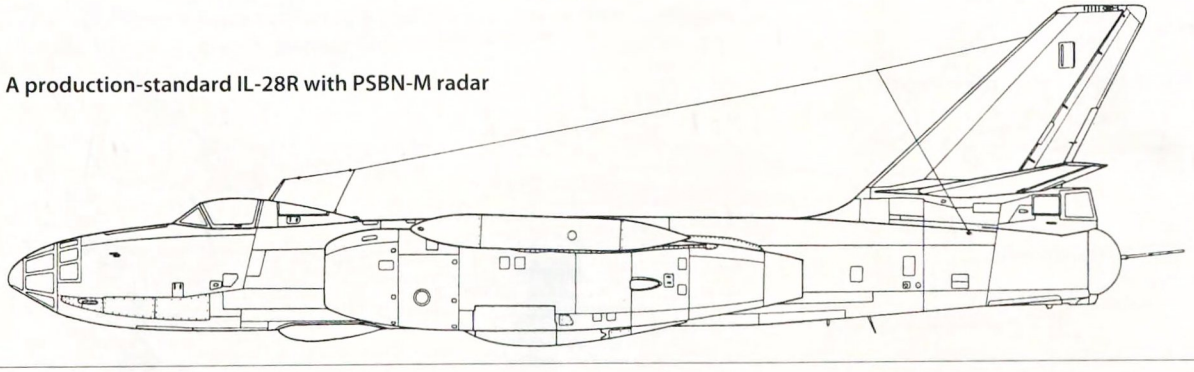
A production-standard IL-28 bomber with Klimov VK-1A engines and forward-mounted PSBN-M radar



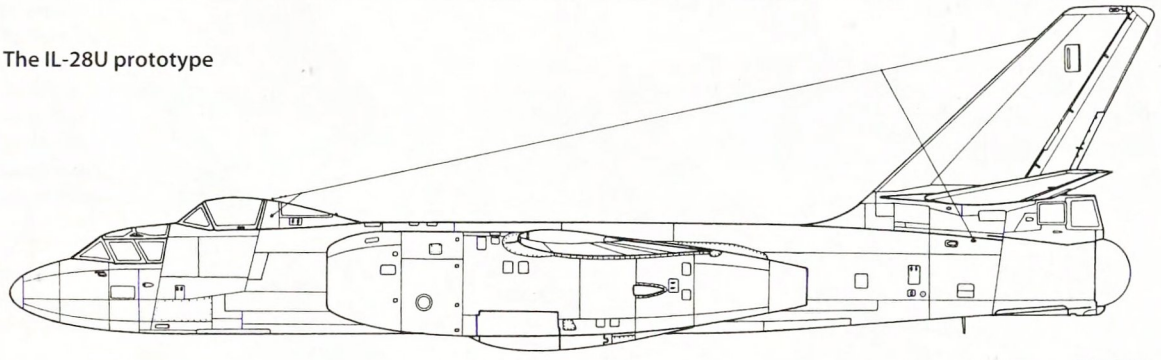
The IL-28R prototype



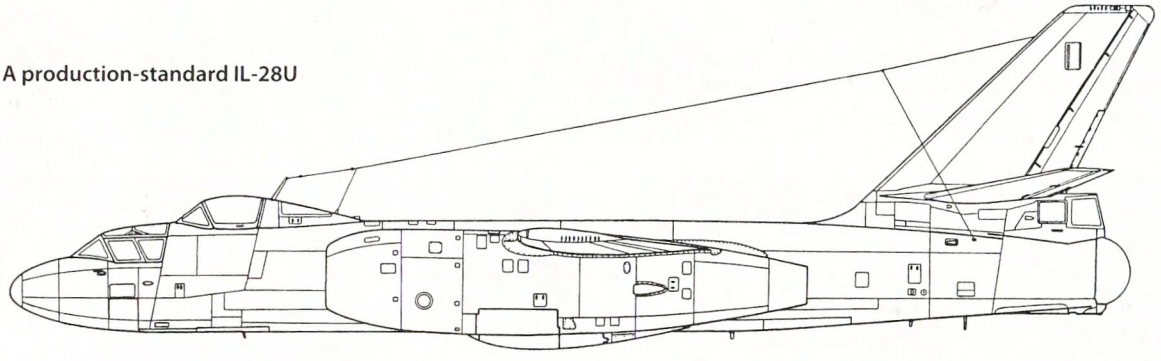
A production-standard IL-28R with PSBN-M radar



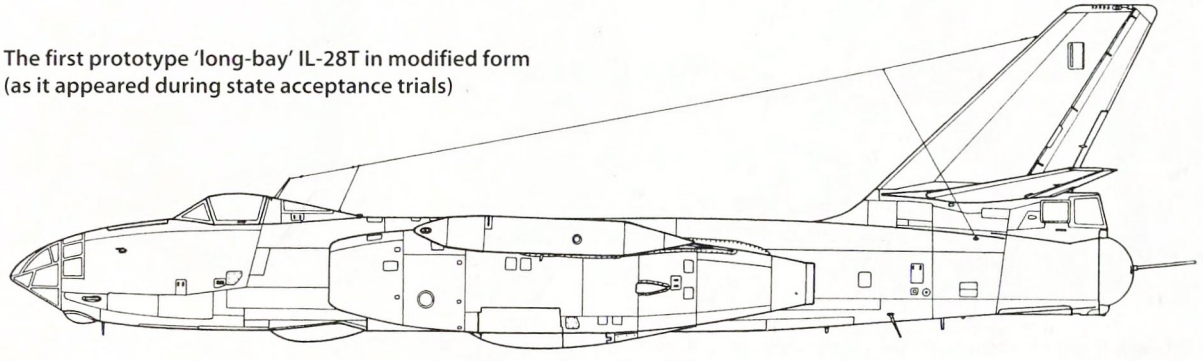
The IL-28U prototype



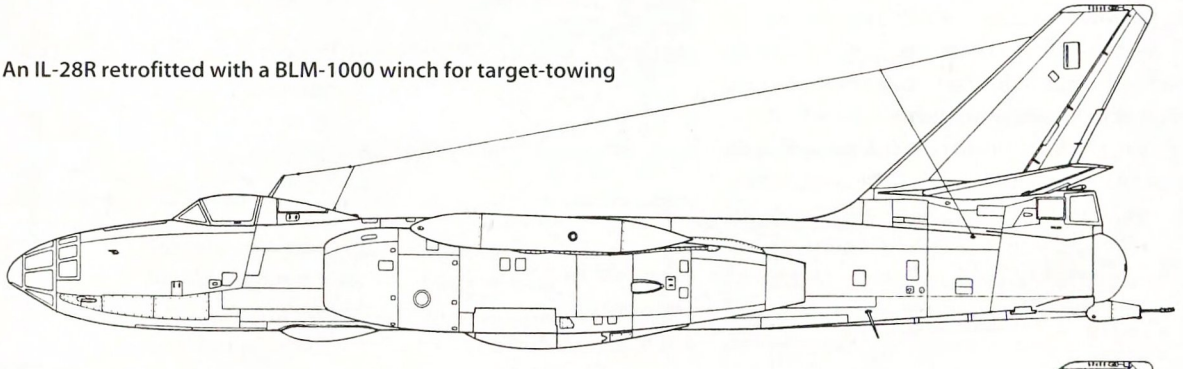
A production-standard IL-28U



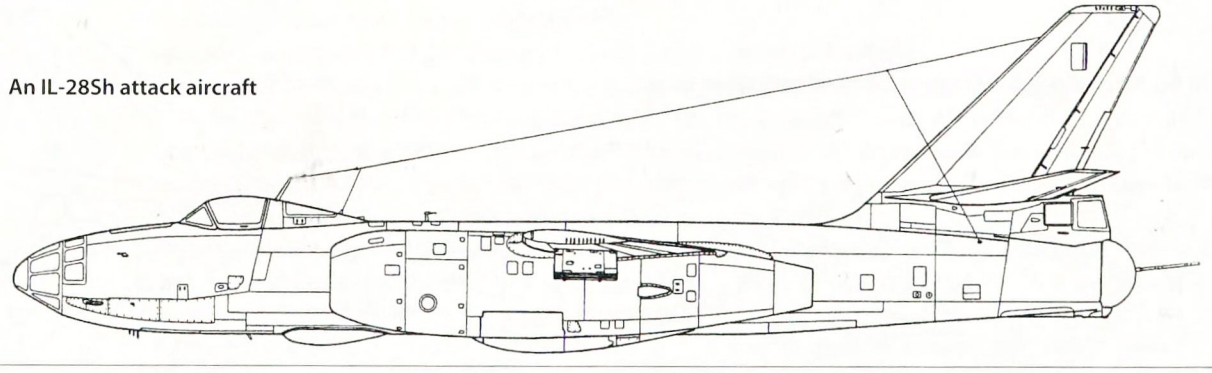
The first prototype 'long-bay' IL-28T in modified form
(as it appeared during state acceptance trials)



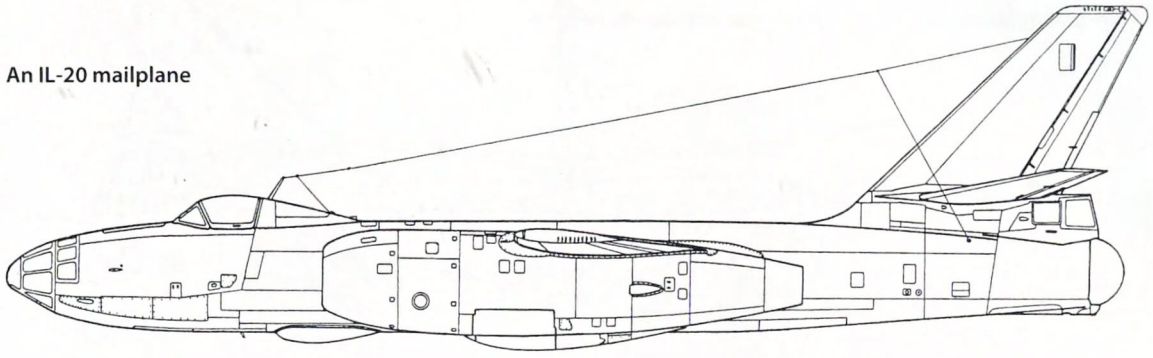
An IL-28R retrofitted with a BLM-1000 winch for target-towing



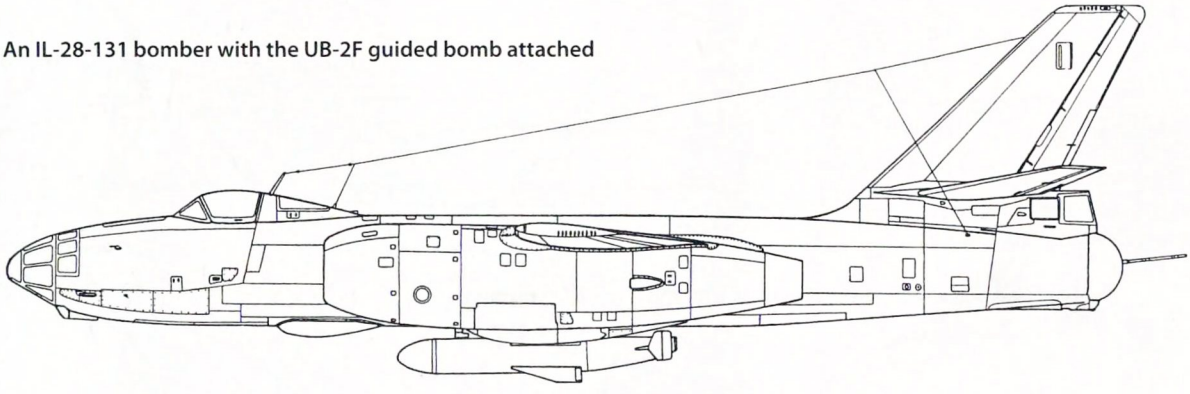
An IL-28Sh attack aircraft



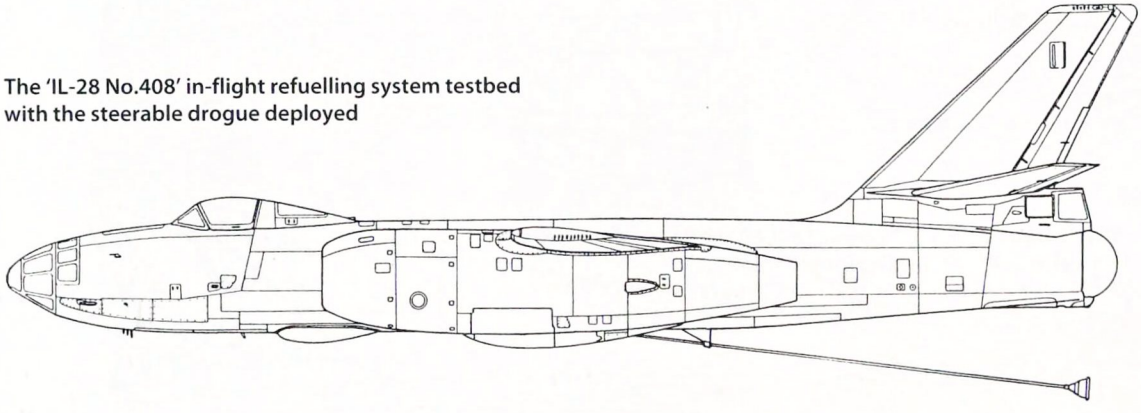
An IL-20 mailplane



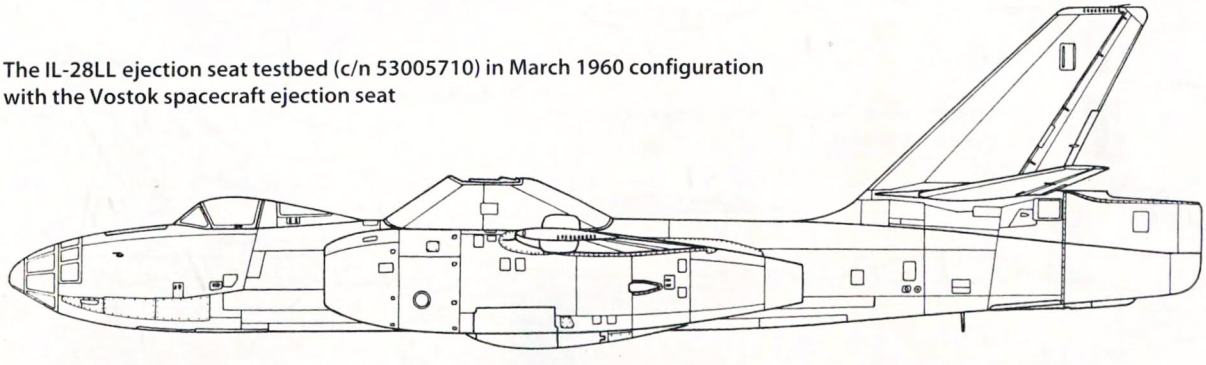
An IL-28-131 bomber with the UB-2F guided bomb attached



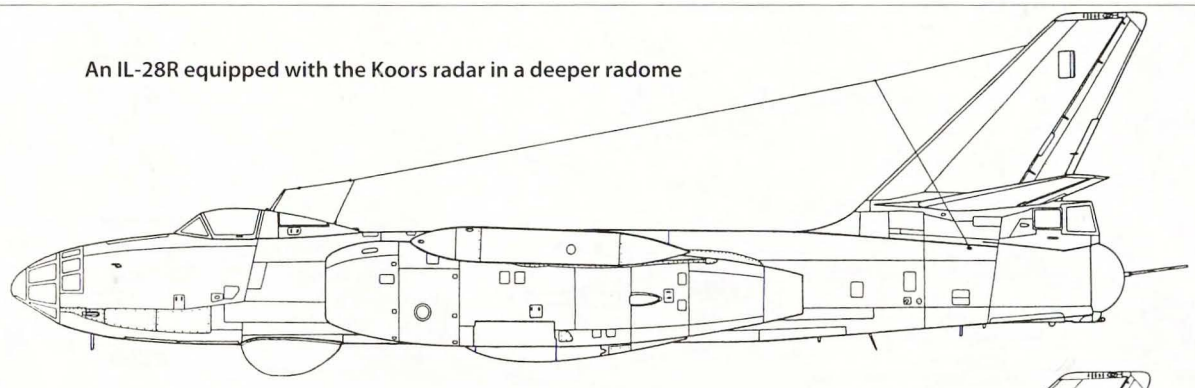
The 'IL-28 No.408' in-flight refuelling system testbed
with the steerable drogue deployed



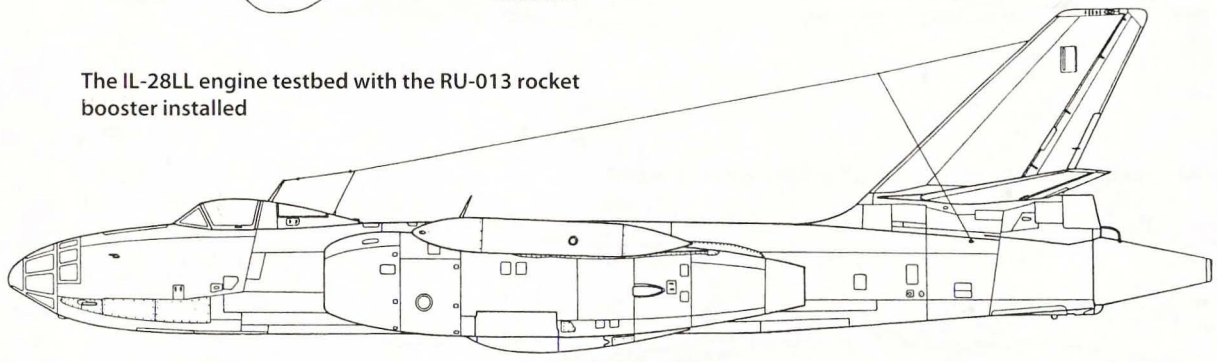
The IL-28LL ejection seat testbed (c/n 53005710) in March 1960 configuration
with the Vostok spacecraft ejection seat



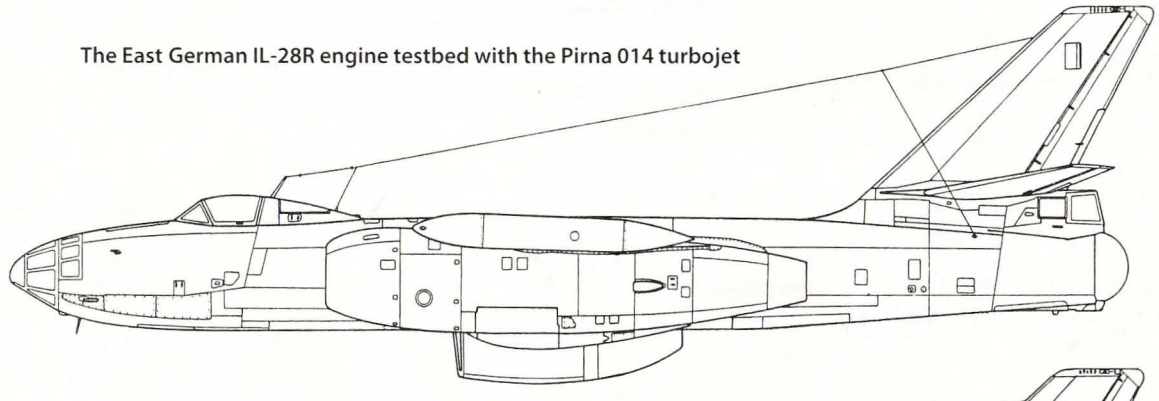
An IL-28R equipped with the Koors radar in a deeper radome



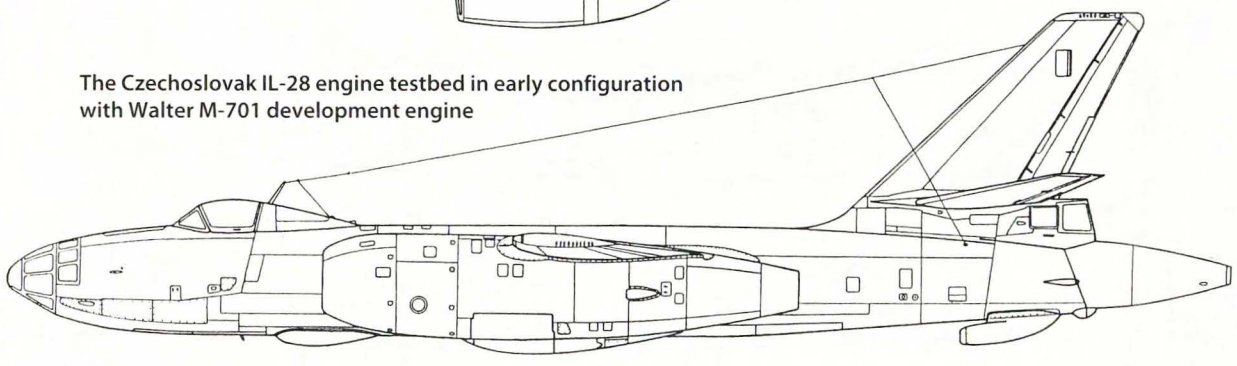
The IL-28LL engine testbed with the RU-013 rocket booster installed



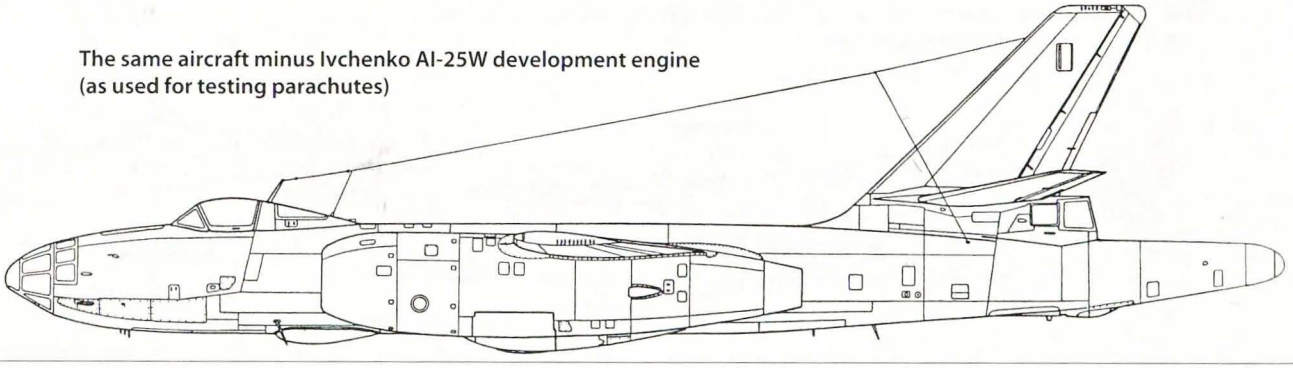
The East German IL-28R engine testbed with the Pirna 014 turbojet

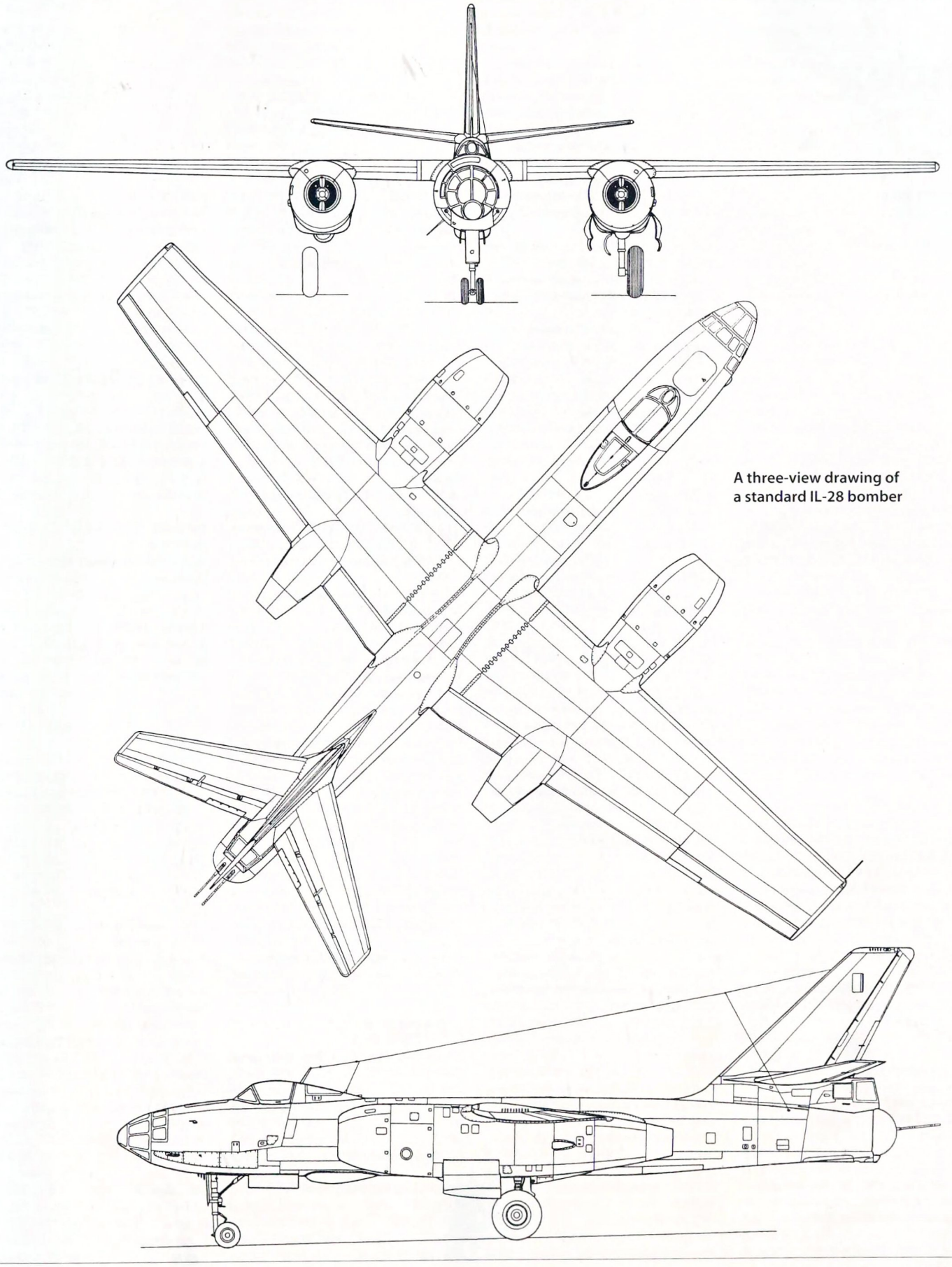


The Czechoslovak IL-28 engine testbed in early configuration with Walter M-701 development engine



The same aircraft minus Ivchenko AI-25W development engine (as used for testing parachutes)





A three-view drawing of a standard IL-28 bomber

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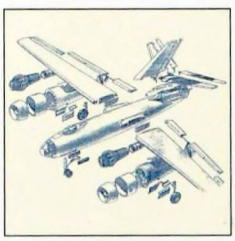

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